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Seventh Fleet Field Training Exercise
Fleet Battle Experiment Kilo
Fires Initiatives Final Report

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13. ABSTRACT (Maximum 200 words.)

Fleet Battle Experiment Kilo was conducted during Seventh Fleet exercise Tandem Thrust 03. During the Field Training Exercise phase, testing of Time Sensitive Targets processes using the Joint Fires Network was carried out. This report contains results obtained on contributions made by the Joint Fires Network to Navy Time Sensitive Targeting and experiment lessons learned.

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1.0 EXECUTIVE SUMMARY

1.1 SEA STRIKE INITIATIVES

Fleet Battle Experiment KILO (FBE-K) contained two primary Sea Strike initiatives:

Initiative # 1: Refinement of Commander Seventh Fleet Joint Fires Network Concept of Operations (C7F JFN CONOPS) and Commander, Seventh Fleet / USS BLUR RIDGE Time Sensitive Targeting Standard Operating Procedures (C7F TST SOP).

Initiative #2: Establishment and examination of requirements for utilization of a Distributed Maritime Sensor and Fires network that integrates a Coalition engagement node within that network**.**

In addition to CONOPS evaluation, a major component of Initiative #1 was for NWDC and C7F to examine and document theater support requirements inherent to standing up a Joint Fires Network (JFN) architecture in a forwarded deployed theater. JFN was to be tested in support of JTF TST operations. Initiative #2 was to test both the coalition information filter within the maritime engagement grid and processes for Coalition participation in TST.

1.2 OVERVIEW

FBE-K was conducted in conjunction with the USPACOM exercise TANDEM THRUST 03 (TT03), which consisted of two segments, a Command Post Exercise (CPX) and a Field Training Exercise (FTX). The centerpiece of this effort was the C7F flagship, USS BLUE RIDGE (LCC-19). C7F (as designated by COMPACFLT) has the requirement to use the flagship as a deployable host for the Joint Forces Commander, and designated Component Commanders and staffs in theater. C7F was embarked in LCC-19 as the CJTF with an embarked JFACC element to plan and execute OPLAN(s) and contingency operations.

The Sea Strike initiatives focused on the command and control (C2) processes centered at the Joint forces Commander and Component Commander levels. The principal TST C2 elements were JFACC Afloat and the JFMCC XP Cell. Coalition command was located on the virtual ANZAC and it coordinated with the XP cell.

TST processes were to be supported by C7F's employment of the Joint Fires Network (JFN) suite installed aboard BLUE RIDGE. It included Joint Services Imagery Processing System-Navy (JSIPS-N), Precision Targeting Workstation (PTW), and the recently installed Army Deep Operations Coordination System (ADOCS) and Tactical Exploitation System-Navy (TES-N). TES-N was in the Joint Intelligence Center (JIC) and ADOCS terminals were in the JIC, the Joint Operations Command Center (JOCC) used by the JFACC, and XP cells. TST processes to be tested were allocation/reallocation of weapons and sensors, target assignments, and fire-mission deconfliction.

Considerable difficulties in fulfilling Sea Fire Initiative objectives were experienced during experiment execution due to reduced JFACC manning and equipment problems. Because of this, the experiment and exercise became decoupled, with the exercise proceeding as planned but with little or no support from JFN or the experiment personnel. The results reported here are from what was accomplished by the experiment as essentially a separate entity.

There was not an approved C7F JFN CONOPS or C7F TST SOP available to test during the experiment. NWDC provided draft documents based partly on the PACAF Draft TST SOP and NFN TACMEMO. Because of equipment problems, lack of operator training on the new systems, and little operator familiarity with TST SOPs and/or TTPs, no TST CONOPS or SOP evaluation could be performed. Rather, the experiment served to introduce the SOPs and TTPs to Fleet personnel. Development of C7F TST SOP requires development of operational (N3) procedures and coordination with Fleet staff.

1.3 FIRES INITIATIVES PRINCIPAL FINDINGS

Findings obtained for the Fires Initiatives are qualitative rather than quantitative, and cover broad aspects of TST processes rather than specifics. Training on some of the component systems was conducted and Fleet personnel acceptance of the systems and the possibilities they present for improved operations was documented. Possible TST process improvements were obtained rather than a determination of what process and system combinations do and do not work.

Substantial specific information was obtained on hardware system performance. FBE-Kilo introduced the use of JFN, including TES-N, to Seventh Fleet personnel. Definitive recommendations for needed system and process improvements before JFN can achieve the needed level of performance for TST have been identified.

1.3.1 System Improvements

FBE-K produced a significant number of recommendations for system improvement. A number of these had already been identified in previous experiments. No further operational experimentation should be conducted with JFN without first making these improvements.

Tactical Exploitation System – Navy TES-N has a number of powerful tools (some of which are unique to TES-N) that potentially could be of great use to naval forces involved in TST. FBE-K reconfirmed that TES-N remains a very complex and developmentally immature system, with extremely limited interfaces to other C4I systems that are critical to TST. Major advances are needed for: Interface with ADOCS or other TST Command and Control system; Interface with GCCS-M; Interface to PTW and any external target folder applications; Handling of ISR video and platform/sensor telemetry; SCI COMINT analysis tools and SCI-to-GENSER connectivity via ISSE Guard

ADOCS as the TST Command and Control System TST C2 system requirements should look beyond the extensive typing input-output approach in ADOCS and its matrix displays for TST

coordination status. Many of the C2 processes in ADOCS are complicated, difficult to define unambiguously, challenging to train, and highly dependent on internet chat and voice elaboration.
ADOCS is an Advanced Concept Technology Demonstration (ACTD), but the challenges evident in FBE-K raise the question if the ADOCS approach is the right concept to be applied to Joint Time Sensitive Targeting. Because of the time-sensitivity of the targets and because it is at the tactical level of war, some of the functionality built into air defense command and control systems, such as AEGIS or AWACS should be examined for applicability to ground TSTs. If ADOCS is to be used, the improvements listed below are needed.

The ADOCS Managers exhibit inconsistencies and latencies that at times inhibit and occasionally defeat the TST engagement process. Problems observed include: Missions appear in some ADOCS workstations but not others. The coordination block status can be different at different ADOCS workstations. The mission status (e.g. fired or not fired) may be different in the Mission Coordination: Fires and JTST Managers. Mission status as determined from the Mission History may not agree with the status in the Mission Coordination: Fires display. Some events are missing from the Mission Histories. Troubleshooting and fixing these inconsistencies is required.

A TST C2 System needs functionality for automatically and unambiguously keeping track of targets that move, re-position, and change status. ADOCS needs functionality added for such targets, i.e., dynamic target position information rather than static data fields. Concurrently, functionality is needed for automatic updating and alerting of decision makers and engagers. Functionality is also needed for other critical changes in target status, such as missiles transitioning from stowed to erected positions. This may require dynamic updating of target description, and certainly needs automatic updating and alerting of decision makers and target engagers.

Several Human-System-Interaction (HSI) improvements are needed. Means are needed for target prioritization, pending task notification, standardized critical task color-coding. These may appear to be trivial matters, but the current situation is such that HSI plays a significant role in hindering TST processes and lengthening the timeline. Color-coding isn't merely a training or doctrine issue. Because it is being used for coordination of time-critical tasks, the colors or symbols used should be engineered to be much more intuitive than they are. Ideally, as intuitive as real traffic lights so that people will respond predictably, and quickly.

1.3.2 Fires TTP

Frequent and serious departures from the Fires TTP were partly due to player confusion or misunderstanding regarding procedures and partly caused by ADOCS displays latencies and inconsistencies. Observed departures in ADOCS coordination block actions included: required TTP actions were not being taken, actions taken but not by the responsible node, actions taken that are undefined by the TTP (hence meaningless), and actions executed in the wrong sequence. A concerted effort is needed to develop adequate TTPs and train to them.

1.4 COALITION INITITIVE PRINCIPAL FINDINGS

The two processes in place for multilevel and multinational security of information transfer were Radiant Mercury Gold (RMG) for automated message transfer and a manual screening process for chat (e-mail-like) messages. Situations where these measures actually inhibited proper information flow were inherent in the design of the network. ADOCS coordination messages were not recognized by RMG and there was an inherent delay caused by having chat messages manually reviewed for security before being passed.

It was not possible to assess the adequacy of security procedures and whether they enabled or hindered Joint and Coalition planning because there was no distributed planning cell with exclusive responsibility for developing, reviewing, distributing, and modifying daily planning. Discrepancies were observed between timing information in the daily Air Tasking Order (ATO) and the weapon-target pairing assistance provided by experimental ADOCS on the U.S. side. These problems were never resolved, so cases where Coalition participants were included in planning processes could not yield conclusive information.

1.4.1 Coalition Fires TTP

The most significant issue encountered by Coalition was the absence of a clearly defined, tactical level, step-by-step, C2 process for coordination of fires. Creation of a step-by-step process for fires coordination part way through the FTX was too late and discussion was focused on understanding processes rather than on improving it. Operator confusion at ANZAC and at the Coalition Cell was high, which lead to lengthy chat and VoIP communications for clarification.
The lack of SOPs for the fires coordination process, together with the continued presence and efforts to resolve ADOCS integration issues essentially undermined all unit and higher-level training. The result was Coalition team on-going confusion in the fires coordination process.

1.4.2 ADOCS and RMG Rule Sets and Interface

RMG bridged the security boundary between the SECRET US NOFORN and SECRET AUSCANUKUS releasable networks. GCCS-M COP was transmitted effectively across RMG.

Due to budget and time constraints for RMG accreditation, a previously approved rule set was used. It did not use the latest message format used in ADOCS so that exchange prototype messages generated by ADOCS could not be recognized by RMG. Thus, not all of the data sent through RMG from SECRET US NOFORN ADOCS was transferred to the Coalition network.

The RMG/ANZAC ADOCS interface had problems. Coordination block problems resulted in ANZAC transmitting, by IRC, to the BLUE RIDGE desired coordination block actions that were then inserted in the ANZ coordination block by a BLUE RIDGE ADOCS operator. No ANZAC GISRC target nominations were found in the ADOCS FBE net servers; reason unknown.

1.4.3 Chat, Voice Over IP, and Sneaker-Net

Radiant Mercury Guard was used to filter and transfer structured messages. To exchange

unstructured messages (Chat, e-mail, VoIP, web pages) between U.S. and Coalition systems, a human-in-the-loop 'air gap' (Sneaker-Net) was utilized. Information from U.S. was reviewed and relevant information for Coalition was transferred across the boundary. Transcribing messages between the XP cell on BLUE RIDGE and the ANZAC command team in Fern Hill led to some ambiguity in communication. The air gap introduced latencies of about seven minutes and was manpower intensive. An automated filter (e.g. ISSE Guard) is required.

VoIP was of high quality after network issues were resolved. It was effectively utilized for technical troubleshooting and demonstrated a potential for use for tactical coordination.

1.5 ORGANIZATION

Time Critical Targeting Functionality Afloat TCTF is a USAF program that outlines C2 requirements and systems for conducting TCT operations. The X-Ray Papa cell was an excellent test case for familiarizing the Fleet with the TCTF concept. The USN needs to refine this concept to support joint and maritime forces for a JFC Afloat configuration. The TCTF Afloat concept should be a starting point for future Sea Strike initiatives.

X-Ray Papa and Maritime Component Time Sensitive Targeting The X-Ray Papa cell identified a time sensitive targeting gap at the maritime component level that needs to be addressed. JFMCC's conduct of broad scale TST operations that are integrated with other components is beyond the traditional role of the Bravo Papa. A staff function at the operational level (JFMCC) that supports TST prosecution is required. This effort should be integrated with the TCTF effort described above to help identify maritime TST command and control requirements of the future.

1.6 COP ISSUES

A true "Common" Operational Picture is non-existent. In FBE-K, a COP was not maintained to a level required to support ISR and JFN in support of TST. Different pictures always existed in GCCS-M, ADOCS, and TES-N.

In spite of this, some COP goals were achieved; by the end of FTX, all of the simulated Blue ISR assets active in M&S were simultaneously displayed on BLUE RIDGE's GCCS-M COP with appropriate labels (e.g., two ISR UUVs, two Predator UAVs, one U-2). This was the first time that this has happened in an FBE.

Exchange of TST information between TES-N and GCCS-M remains a problem.

TST location output to COP The TST nomination analyst used TES-N's interface to GCCS-M to input the target into the COP as a track to assist in tracking the TST while waiting for it to be engaged. This procedure only worked for two days at the same rudimentary and sub-optimal level at which it was working for MC02/FBE-J (the new TES-N version 5.0 provided no

improvement). For the remainder of FBE-K it was functionally inoperative.

GCCS-M COP Tracks into TES-N ITD It was also planned that GCCS-M, COP tracks be sent from GCCS-M to TES-N. The objective was to provide a richer context of contacts, tracks, Blue ISR asset locations, etc., in TES-N for the analysts trying to find/fix TSTs. TES-N's incoming "Message and Data Log" showed a good number of incoming tracks from GCCS-M, but those tracks did not parse into the TES-N ITD. When GCCS-M tracks coming into TES-N were able to be brought up on the ITD it did not display any track labels. (GCCS-M tracks in TES-N's ITD appeared in their proper locations but the symbols do not have any labels associated with them (e.g., no track names), making them all but functionally useless to the TST team.)

1.7 TECHNOLOGY

FBE-K revealed a number of equipment problems. System performance and compatibility issues are hindering obtaining operational benefits that should be realized from some of the new systems. Recommendations contained in this report will have an impact on hardware system program management, if implemented. Some of these issues are long standing and should be addressed before further experimentation with these systems is carried out. Details are contained throughout the report, particularly in Sections 6.8, 6.9, 6.11, and Appendices C and E.

Shipboard System Specifications USS BLUE RIDGE has a 10 mb switch backbone that is connected via 155 mb links. This, along with inconsistent network card setting hindered ADOCS use. Standard, shipboard LAN configurations that support ADOCS need to be established for switch, link, and network card settings on these machines. Hardware limitations may require platforms to set up multi-server configurations to reduce the effect of less modern network backbones. ISNS ADOCS standards should be set prior to install and configured accordingly.

ADOCS Changes Many recommended changes to ADOCS were compiled during FBE-K. These are for providing adequate support to TST within currently existing C2 capability requirements. New processes that are being experimented with will undoubtedly introduce additional requirements. Improvements are needed to enhance situational awareness, e.g., target status and alerting for required actions. Hot links are needed to provide easy access to important background information such as ROE, TST priorities, and target folders.

JFN interaction with ADOCS ATI.ATR target nomination to JFN was incomplete and not usable. This problem was identified over 2 years ago, still exists, and needs to be fixed. Detailed ADOCS–JFN testing should be completed in the lab and needed modifications made rather than waiting for another experiment.

The TST nomination analyst used TES-N to create a target nomination message (in USMTF "ATI.ATR" format), and sent that nomination message (via SMTP) to the ADOCS server on BLUE RIDGE, and to the TST Target Folder server at NWDC. Considerable effort was required to get all systems interoperating correctly: TES-N LAN, ship's LAN/Exchange server, FBE-K

WAN and Exchange servers, and ADOCS mail server. Once set up properly the process worked well.

Inconsistencies existed in how target nominations were handled by ADOCS and how they were showing up in the TST Target Folder server. The fault was in both TES-N and ADOCS, with inconsistencies in target line usage. ADOCS turned around an ATI.ATR with fields out of order and truncated.

Images related to target nominations to PTW for aim-point refinement Images (e.g., video "chips" showing the TST) were to be attached to outgoing target nominations, and the nomination sent simultaneously to ADOCS, the TST Target Folder, and PTW. The version of PTW used on BLUE RIDGE could not receive and parse ATI.ATR messages (i.e., did not have the DTMS software used in MC02/FBE-J). TES-N does not allow images to be attached to outgoing ATI.ATRs.

1.8 Equipment Casualty Modes

A TST C2 System needs to have reliable alternative modes of operation and more graceful degradation than is currently available with open-architecture LANs and internet-style networks. Most legacy combat systems have casualty modes and some have several levels of casualty modes. The down-time and network problems encountered in FBE-K may not be atypical of what might occur in the real world with leading edge technologies, pushing the envelope, built on open-architecture machines and networks.

1.9 Pre-Experiment Testing and Go/No-Go Decision

Some of the difficulties encountered in FBE-K were known prior to the experiment. Equipment problems were uncovered when tests were run on-site immediately before embarkation. The question arises as to whether an experiment should be conducted under these circumstances. An FBE naturally build up a momentum toward execution that is almost irresistible. There is no process to decide whether or not to execute an experiment or to scale it back to a level that can be achieved. Two recommendations are germane to this issue. First, establish a time at least six weeks prior to an experiment by which all equipment to be used is tested and demonstrated to operate adequately to meet experiment goals. If that level is not achieved, the equipment cannot be fielded. Second, establish a process for periodic review of experiment status. At each review, demonstration that sufficient progress has been achieved to warrant continuing must be made or an automatic no-go or scale-back decision follows.

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2.0 INTRODUCTION

The following italicized descriptions are taken directly from the Navy Warfare Development Command (NWDC) FBE KILO Experiment Plan.

Fleet Battle Experiment K (FBE K) will be conducted in the spring of 2003, the 11th experiment in the FBE series. It will be conducted in conjunction with the USPACOM tier 1 level exercise, Tandem Thrust 03 (TT03). TT03 is comprised of two events, a Command Post Exercise (CPX) and a Field Training Exercise (FTX); FBE K will participate in both events.

As part of FBE K, many of the Experiment's initiatives will focus on the command and control (C2) processes centered at the joint force level. A primary goal is to apply the concepts of Network Centric Warfare (NCW) to the processes used to support a Joint Task Force (JTF) staff and a Joint Forces Air Component Commander (JFACC) while they are embarked aboard a Joint Fires Network (JFN) equipped command platform (USS BLUE RIDGE LCC-19). FBE K will concentrate on the allocation / reallocation of both weapons and sensors, target assignment, and fire mission deconfliction in support of the JFACC execution of Time Sensitive Targeting (TST) operations at the joint force and component level. FBE K will use a common set of automated tools and common system architecture aboard the USS BLUE RIDGE that enables effective TST C2 and joint task force coordination. This flexible Joint Fires Initiative C2 architecture is designed to increase the speed and tempo at which the JTF as a whole can conduct TST operations.

In support of these goals, there were two Sea Strike Initiatives, which we have named "TST Processes" and "Coalition" for the purposes of this report. The Initiative Statements for each in the Experiment Plan are:

TST Processes Initiative. *Refinement Of Commander, Seventh Fleet Joint Fires Network Concept of Operations (C7F JFN CONOPS) and Commander, Seventh Fleet / USS BLUE RIDGE Time Sensitive Targeting Standing Operating Procedures (C7F TST SOP).*

Coalition Initiative*: Establishment and examination of requirements for utilization of a Distributed Maritime Sensor and Fires network that integrates a coalition engagement node within that network.*

In October 2002 the C7F Flagship, USS BLUE RIDGE, received a TES-N installation. Upon installation completion, the JFN Program Office developed a draft Concept of Operations (CONOPS) tailored to C7F needs. That draft CONOPS was not adapted by C7F. Instead, C7F desired to develop procedures based on the Pacific Air Forces (PACAF), Joint Forces Air Component Commander (JFACC) Afloat, Time-Critical-Targeting (TCT) Standard Operating Procedures (SOP). C7F requested NWDC assistance in exercising JFN aboard Blue Ridge and refining C7F Joint Time Sensitive Targeting (TST) procedures.

The emphasis during the TT03 FTX was on collaboration and coordination between CJTF ISR Operations and multiple components, and on tools to speed coordination and enable common situation awareness of TST status. Specifically,

- Emphasize collaboration/coordination between CJTF/JFACC/JFMCC TST elements
- Exercise Army Deep Operations Coordination System (ADOCS) network between CJTF and multiple components

2.1 FIELD TRAINING EXERCISE

The purpose of the Field Training Exercise (FTX) is to train a U.S. Pacific Command Joint Task Force (JTF) under Commander, U.S. Seventh Fleet operating as the Commander of the JTF. This was done within the structure and scenarios of Tandem Thrust 03. The exercise scenario was defense of a fictitious island nation Guppie against an aggressor island nation Piranha. The scenario was complicated by the presence of military forces from the fictitious nation of Orca, which was sympathetic to Piranha but not overtly engaged in aggressive action.

U.S. Joint Task Force tasking included:

- Secure SLOCs/ALOCs within the Joint Operating Area
- Forcible entry. Re-take friendly territory seized by aggressor nation
- Conduct Humanitarian assistance operations
- Fortify/defend friendly nation(s)
- Establish bases for future combat operations against aggressor
- Eliminate aggressor's ability to threaten region

The command structure for the exercise was:

CJTF – COMSEVENTHFLT embarked USS BLUE RIDGE
JFMCC – CTF 70 embarked USS CARL VINSON
Theater ASWC – CTF 74 Yokosuka Japan
Expeditionary Strike Group (ESG) Commander – embarked USS ESSEX
JFACC – PACAF O-6 embarked USS BLUE RIDGE
- JFACC TST Cell O-4 embarked USS BLUE RIDGE
JSOTF – SOCPAC O-6 COMNAVFORMARIANAS Guam
JFLCC – embarked USS BLUE RIDGE

There were extensive live forces participating in the overall TT03 FTX. However, the live forces did not participate in the Fires Initiative of FBE-K, and so they are not listed in this report.

2.2 TST PROCESSES INITIATIVE

The purpose of the Fires Initiative was primarily to determine the support to TST that can be provided by JFN. The TES-N portion of JFN resided within and was utilized by the Joint Intelligence Center (JIC). ADOCS was to be used for the engagement COP primarily in the Joint Air Operations Center (JAOC) on the Blue Ridge.

Initiative number one's primary goal is to support C7F in refining and validating its C7F JFN CONOPS / C7F TST SOP. This initiative will attempt to (to the maximum extent possible) define JFN support to operations in the three roles that it will be employed by C7F. The roles are as an embarked CJTF with other supported staff(s) embarked, as an embarked JFMCC/NAVFOR, and as the Fleet JFN/JFN supporting deployed RTCs and RTC Lites.

Additional benefits of this initiative include providing material to update the JFACC (Afloat) PACAF CONOPS, define personnel and training requirements for X-INT fusion to the Target Data Base, and examination of JFN impact on the Air Tasking Order (ATO) process. Another important objective is to assess the adequacy of USS BLUE RIDGE's legacy communications to support JFN.

All of the stimulus necessary to examine the CONOPS/SOP will be by simulation. There are no live events during the CPX. During the CPX, JWFC will provide the majority of the simulation, as they are tasked by CPF to support the CPX primary goal of certifying C7F as a CJTF. NWDC will provide some UAV and cross-INT simulation for direct stimulation of the JFN suite aboard USS BLUE RIDGE. The JWFC simulation quality may constrain NWDC's ability to validate the C7F JFN CONOPS. A C7F constraint is that during the CPX all participants will use legacy communications / systems only. Any work not completed during the CPX will continue into the TT03 FTX as required.

Key participants include the entire CJTF command structure and Component Commanders. JFACC participation is essential to meet the majority of objectives in addition to supporting examination of USAF ISR Manager (ISRM) to JFN operations.

The following lists JFN equipment that was installed on the Blue Ridge and its purpose.

Application	Purpose
Gale Lite	On a TES MFWS applied to ELINT analysis.
TES-N	Nomination of TSTs. Sensor management.
JSIPS-N/PTW	Georefinement of TST positions
GCCS-M	COP, track management. Track exchange with TES-N.
Ku-band SATCOM network	Support FBE network
MUSE/AFSERS	Simulated imagery and video for Predator, U-2 and Global Hawk
JSAF	In the CPX, supported imagery generation for MUSE/AFSERS. In FTX, JSAF was the stimulator for the full exercise.
JTLS	CPX stimulator
ADOCS	Cross Component TST collaboration and TST target management
IRC/IWS	Collaboration
IPL	Central imagery repository
Electronic Target Folder	Repository for all TST data.

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2.2.1 TST Processes Initiative Questions

Analytical questions that support C7F JFN CONOPS / C7F TST SOP examination include:

Question 1: How do the limitations of the current wideband architecture (systems and networks) that supports sensor control, ISR fusion, and national imagery reach back aboard LCC-19 when JTF and JFACC (Forward/Afloat) staffs are embarked, affect the functionality/capability inherent to the installed JFN suite?

Question 2: What contributions are made by C7F JFN CONOPS and the underlying SOP, interfaces, and multi-database information displays, to situational awareness of the embarked (aboard a JFN equipped LCC) warfighter at the Operational level?

Question 3: Does the C7F JFN CONOPS and the underlying SOP provide sufficient guidance to use the additional JFN functionality /capability to enable time sensitive targeting operations?

Question 4: Does the C7F JFN CONOPS and the underlying SOP reveal necessary changes to systems, architectures, and information flow processes required to exploit the added capability of an afloat JFN (supporting the JTF staff and a JFACC forward) and an ISR-M supporting the JFACC Main?

Question 5: Does the C7F JFN CONOPS and the underlying SOP support use of JFN functionality/capability aboard the LCC to affect the responsiveness and reliability of ISR command and control with the JFACC (Forward/Afloat) as the coordinating agency?

2.3 COALITION INITIATIVE

The second initiative focuses on the examination of a distributed, maritime sensor and fires network that integrates a coalition engagement node within that network. This network will be overseen by a Experimental (XP) Strike Warfare Commander's XP Cell. This XP Commander, as directed by the Joint Forces Maritime Component Commander (JFMCC), will interact as the maritime support segment to the JTF TST operations during the FTX. This XP Cell will be embarked aboard USS Blue Ridge. The goal is to examine interface and process requirements that support maritime participation in JTF level TST operations in a coalition, distributed environment.

The initiative will exercise dynamic management of a tiered, multi-INT sensor architecture within the experimental architecture to support both the TST operational requirements. NWDC will achieve this by building on past FBE experimentation in ISR Operations to get the right "ISR feeds/data/info" to allow an enhancement in the "fusing" of sensor information to support the AP cell and its assigned combatants. This initiative will occur only during the FTX phase of TT03.

NWDC will establish a Coalition Fires C2 grid interface with NFN through use of a fires C2 tool, the Army Deep Operations Coordination System (ADOCS). Temporary installations of

ADOCS workstations in the Commander, Seventh Fleet's Flagship, USS Blue Ridge and in a series of virtual combatants that will comprise the maritime engagement nodes. These nodes are the virtual DDX at Naval Surface Warfare Center in Dahlgren, Virginia, the E-2Xv at the Naval Warfare Development Command in Newport, Rhode Island, and the virtual ANZAC at the Defense Science and Technology Organization laboratory at Fern Hill, Australia.

By working through the C7F Joint Intelligence Center and the JFACC Afloat TST cell, NWDC will examine the information flow and other engagement processes that are required in establishing a coalition engagement grid within a larger coalition force structure

The addition of Global ISR Capability (GISRC) to the maritime firing units provides future ISR capability and will enable the firing units to monitor simulated UAV's in a Call for Fire spotting role and in a strike support role.

Stimulus will be primarily from the NWDC simulation federation. This federation and the associated stimulus it provides, along with a simulated Mission Reconfigurable Unmanned Undersea Vehicle (MR UUV) deployed from a virtual SSN at NUWC, will contribute to overall ISR stimulation effort for the FBE.

An example of the examined future weapons capability comes in the form of a virtual DD(X) configured with the Long Range Land Attack Projectile (LRLAP), an future ballistic land attack missile and Tactical Tomahawk surface launched cruise missile. Targeted date for potential capabilities is the 2007-2010 timeframe.

2.3.1 Coalition Initiative Questions

Analytical questions that support establishment and examination of requirements for utilization of a Distributed Maritime Sensor and Fires network that integrates a coalition engagement node within that network examination include:

Question 1: What instances demonstrate the current security processes and multilevel security technologies enable or inhibit the "seamless" transfer of warfighting information between joint and coalition forces?

Question 2: Do the current security processes and technologies support distributed collaborative planning between joint and coalition forces?

Question 3: Does the addition of a "dedicated" level of command and control (XP Cell) enhance or detract from the ability of the JOA TST agent (JFACC) to utilize JFMCC assets in the prosecution of a JTF level TST campaign?

Question 4: Does the example in this event, of a networked maritime engagement platform, produce a capability to dynamically command and control non-organic ISR and strike assets in prosecution of a JTF level TST campaign?

3.0 RECONSTRUCTION

3.1 IMPACTS ON THE EXPERIMENT

Circumstances significantly affected the ability to obtain the desired data for this Initiative.

- A TST process was not in place at the start of the FTX.
- The FBE-K Fires events and organization was almost entirely disconnected operationally from the Tandem Thrust 2003 FTX in which Commander Seventh Fleet was conducting live training events.
- Almost all the personnel involved in the Fires Initiative were augmentees new to the equipment, TST process as it was, and environment.
- There were numerous equipment and information failures.

The following describes the impact of these circumstances on the ability to meet initiative objectives. Also provided is a listing of the daily TST events from the MSEL.

Events impacting the experiment began before it began. More than a month prior to FBE-K the proposed JFN/TST CONOPS was rejected by Commander Seventh Fleet and it was decided to use the PACAF TST SOP as a basis. This SOP is not written for a JFACC Afloat with the CJTF so is not entirely appropriate for this initiative's objectives. Conversely, it can also be said that the preparation for the FBE Fires initiative was not entirely appropriate for COMSEVENTHFLT's objectives. The result was that, rather than CONOPS evaluation and/or validation, the experiment shifted to a focus on observing and evaluating activities in order to formulate workable procedures.

Part of the FBE-K Fires Initiative involved an experimental Navy Strike Warfare Commander, called Xray Papa, to play a key role in TST under the JFMCC. By design, Xray Papa would have been embarked in the aircraft carrier with the JFMCC, but due to uncertainty surrounding carrier deployments related to Operation Enduring Freedom and Operation Iraqi Freedom, it was infeasible to install the equipment necessary to set up Xray Papa aboard the carrier. Therefore Xray Papa was embarked aboard Blue Ridge. The actual JFMCC for Tandem Thrust 03 was embarked in the carrier Vinson, and was engaged in the live exercises of the FTX, but not the simulated Fires events of the FBE. For the purposes of TST command and control in ADOCS, e-mail, and chat, Xray Papa aboard Blue Ridge simulated being the JFMCC.

Before the experiment it was also learned that the Air Force would not man a JFACC Afloat as planned, partly due to policy and partly due to demands of Operation Iraqi Freedom. A JFACC was established at Hickam Air Force Base during the CPX, and was closed down during the FTX. A group of three Air Force officers from Hickam were embarked aboard Blue Ridge during the FTX to act as a JFACC TST Cell in Hickam would. There was also an FTX live-fly cell set up in the Joint Air Operations Center aboard Blue Ridge, but they didn't participate in the simulated FBE Fires initiative events. For the purposes of TST command and control in ADOCS, e-mail, and chat, the JFACC TST Cell simulated actions of a larger JFACC Air Operations Center in addition to TST coordination.

The Expeditionary Strike Group (ESG) flagship, USS Essex was outfitted with a JFN Remote Terminal Capability (RTC). However, neither the embarked ESG Commander nor Special Operations Commander participated in the FBE Fires initiative events. For the purposes of TST command and control in ADOCS, e-mail, and chat, Xray Papa aboard Blue Ridge simulated being the Joint Forces Land Component Commander (JFLCC) and the Joint Special Operations Task Force Commander.

The combination of a lack of CONOPS to test, lack of connection between the fires initiative and actual component commanders and live events, artificial manning of essential command and control nodes, limited participation actual Seventh Fleet personnel, limited training of augmentees and equipment difficulties resulted in limited data from which conclusions could be drawn. Even so, data was obtained that throws light on training needs and on the use of JFN for TST by the Fleet.

3.1.1 Manning Impacts

Reliance on Augmentees: Almost all the personnel involved in the Fires Initiative were augmentees new to the equipment, TST process as it was, and environment. Every ADOCS watchstation in the FTX was manned by an augmentee. The TST Targeting Officer in the JIC and all but two of the officers in the Xray Papa cell were reservists. Plus there were three Air Force officers from Hickam, and two operators on temporary duty from NWDC. The training on ADOCS started when they embarked aboard Blue Ridge a few days before the commencement of the FTX, and the experience they gained left with them when they debarked the last day. The Seventh Fleet staff was primarily engaged in the live exercises of the FTX as well as monitoring real-world concerns. The C7F Battle Watch was not involved in the FBE Fires events.

- Impact: Much of the FTX was a learning experience for the augmentees.

Artificial Component Commanders: All actual Tandem Thrust FTX Component Commanders were engaged in live FTX exercises and not engaged in the FBE Fires initiative. All Component Commander roles for TST were played by Xray Papa and JFACC TST Cell augmentees, co-located aboard Blue Ridge.

- Impact: The process did not exercise realistic coordination between battle watch staffs. For example, realistic deconfliction wasn't conducted, and most procedural issues could be resolved easily by face-to-face discussion.

3.1.2 Training Impacts

TES-N Operator Experience Level: Although reported as problematic during the CPX, the TES-N operators were entirely up to the task of using the multi-function workstations for the FTX TST events. This was due in part to experience gained during the CPX, plus additional training by the JFN Mobile Training Team. But there was another training deficiency that was apparent during FTX when TES-N had a greater role in a tactical sensor-to-shooter process. The intelligence specialists in the JIC are trained to develop and produce intelligence products at the

operational level of war. During the FTX, they were put into the unaccustomed position of tactical level evaluation of information and tasking of ISR assets in real time. Their previous training and experience didn't prepare them to have the sense of urgency needed for tactical operations for TSTs.
- Impact: Data collected on the processing times for information with JFN within the Blue Ridge JIC are not likely to be characteristic of processing times for operators trained and experienced in tactical operations.

Simulation Limitations: The simulation imagery had blurry gray background and very distinct, clear black, clip-art targets of interest. The very distinct clip-art targets, that were identical to clipart in the very concise "recognition guide" trivialized the TST requirement for Positive ID (PID) of targets. (i.e., whenever a distinct black spot was noticed, it was by definition a positively ID'd target). Collateral Damage Estimates (CDE) for targets was trivialized because all targets were clearly situated in wide-open spaces. Simulation imagery lacked meta-data needed by IS imagery analysts for developing accurate aimpoints. Visual aimpoint estimation, without distinct high-resolution reference points, and without sophisticated machine-aided imagery registration was not useful for precision aimpoints. Most images lacked precision elevation data. Lack of reality in the simulation had a strong effect on training.

- Impact: Command and control processes for geo-refinement of precision aimpoints and mensuration, which has been a critical element of previous FBE fires experimentation, was essentially eliminated from FBE-K. Analysis using JFN for positive ID and collateral damage estimation, which were critical elements of TST processes in Operation Iraqi Freedom, were also essentially eliminated.

3.1.3 Systems / Data Impacts

ADOCS ran poorly on existing computers on Blue Ridge classified LAN: Operators reported that they experienced delays of several minutes between mouse clicks and computer responses.

- Impact: Time-sensitive actions could not be accomplished in a timely manner. Procedures and training were negatively affected.

No Receipt of COMINT In SCI TES-N: C7F does not currently use the SCI side of TES-N for COMINT analysis.

- Impact: This meant that any COMINT injects, intended to be used as part of for cross-INT analysis by the JFN Team had to be provided by hardcopy or e-mail, and considered off-line.

TES-N Interface with GCCS-M Functionally Limited: The TES-N manual input to GCCS-M COP worked one day during the FTX training, but not for injecting any TST tracks during the remainder of the FTX.

- Impact: TST nominations were never "pushed" to the COP, important to the "Track" step of the TST process, to enhancing the commander's situational awareness, and to the "context" in which TST engagement decision-making must take place.

TES-N Could Not Attach Images to TST Nominations: The Target Nomination application in TES-N did not provide for the attachment of accompanying images / image "chips" (a shortfall identified during FBE-J that was reportedly to be rectified by FBE-K).

- Impact: During MSEL Events, TST-related images were manually moved (FTP) to PTW, with the nominating Analyst providing verbal cueing to the PTW operator as to which Target Block Number related to which image. The PTW analyst then changed the image filename appropriately (much easier to do in PTW than TES-N), and saved the re-named image to a shared network drive. The JIC Targeting Officer then drafted a SIPRNET email (in MS Outlook), and attached the appropriate image(s) from the shared network drive, and sent the email to the NWDC TST Target Folder Server for ingest.

3.1.4 Equipment Status Matrix

The following table (in five segments) shows the daily status of JFN equipment during FTX.

DATE (Guam time)	COMINT (via SI bcast)	ELINT (via TDDS)	ELINT (from TES-N Gale into ITD)	IMINT (via JCA)
FRI 25 APR	Trying to get C7F CTR to script and send via SI bcast back to herself on TES-N	TNMC will not accept injects from JSAF or ISR UUV (workaround via ASSET)	New CTT, needs training, but first had account issues	Used to transfer sim "PHOTINT" from ISR UUV in NITF format.
SAT 26 APR	Still configuring SCI side of TES-N to recv NRTD SMTP feed	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE being input to Cross-INT, displayed on ITD	Not used in todays Events
SUN 27 APR	No further progress (unable to examine further)	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE being input to Cross-INT, displayed on ITD	Not used in todays Events
MON 28 APR	No further progress (unable to examine further)	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE could not be displayed on ITD	Successfully pulled from JCA to BLR IPL, used by analysts in PTW and TES-N
TUE 29 APR	No further progress (unable to examine further)	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE being input to Cross-INT, displayed on ITD	Successfully pulled from JCA to BLR IPL, used by analysts in PTW and TES-N
WED 30 APR	No further progress (unable to examine further)	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE being input to Cross-INT, displayed on ITD	Successful
THU 01 MAY	No further progress (unable to examine further)	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE being input to Cross-INT, displayed on ITD	Not used in todays Events
FRI 02 MAY	No further progress (unable to examine further)	Using ASSET workaround to send LOBs; not showing up in TES-N GALE	Non-LOB ELINT coming to TES-N GALE being input to Cross-INT, displayed on ITD	Not used

DATE (Guam time)	U-2 Imagery (fm AFSERS TENCAP)	U-2 Telemetry (fm AFSERS TENCAP)	Video (from AFSERS MUSE)	Images to PTW for aimpoint refinement
FRI 25 APR	Not explicitly used in todays Event, but tested good	Not explicitly used in todays Event, but tested good	Video rec'd, chips produced, used for target noms	DPPDB rec'd, being loaded
SAT 26 APR	Not used in todays Events, but tested good	Not used in todays Events, but tested good	Video rec'd, chips produced	DPPDB loaded, some visual point transfer tests conducted
SUN 27 APR	U-2 was "flying" but not coming through to TES-N EMPS	U-2 was "flying" but not coming through to TES-N EMPS	Video rec'd, but unable to save chips to DBO (TES-N database problems)	(Unable to examine)
MON 28 APR	"Low res" rec'd in Screener (but can't be chipped), "hi res" in DBO (but res still poor)	Telemetry being rec'd, but got EMPS error, "Sensor not found."	Video rec'd, chips produced, FTP'd to PTW	Used DPPDB to do visual point transfer, collateral damage est., etc
TUE 29 APR	"Low res" rec'd in Screener (but can't be chipped), "hi res" in DBO (but res still poor)	Telemetry being rec'd, but got EMPS error, "Sensor not found."	Video rec'd, chips produced, FTP'd to PTW	Used DPPDB to do visual point transfer, collateral damage est., etc
WED 30 APR	"Low res" rec'd in Screener (but can't be chipped), "hi res" in DBO (but res still poor)	Telemetry being rec'd, but got EMPS error, "Sensor not found."	Video rec'd, chips produced, FTP'd to PTW (video freezes on one workstation)	Not used in todays Events
THU 01 MAY	Not used	not tried	Video rec'd, chips produced, FTP'd to PTW	Used DPPDB to visually estimate aimpoint
FRI 02 MAY	Not used	not tried	Video rec'd, chips produced, FTP'd to PTW	Sim National Image used for Lat/Long aimpoint. No elevation

DATE (Guam time)	Target nom to ADOCS	Target nom to Target Folder Server	Target (Manual Contact) to GCCS-M COP	GCCS-M COP Tracks into TES-N ITD
FRI 25 APR	Data integrity still needs testing. Outgoing queue inop for one day of OSD testing	[TES-N unable to attach images; work around uses Outlook, PTW, shared drive]	Finally got it to work to same level as FBE-J	Has been inoperable for several days (but no one noticed)
SAT 26 APR	TST nom.s (ATI.ATRs) stuck in outgoing message queue	TST nom.s (ATI.ATRs) stuck in outgoing message queue	Not used in todays Events, because no TST noms could be done	Some tracks coming into Msg & Data log again, but not able to examine further
SUN 27 APR	TST nom.s would not save in database, could not be sent out	TST nom.s would not save in database, could not be sent out	Manual Contacts would not save in database, could not be sent out	Tracks could not come in, possibly due to database problems
MON 28 APR	TST nom.s would not save in database, could not be sent out	TST nom.s would not save in database, could not be sent out	Manual Contacts would not save in database, could not be sent out	GCCS-M tracks coming into Msg & Data log again, but could not be pulled up on ITD
TUE 29 APR	TST nom.s successful. Data integrity needs controlled testing.	[TES-N unable to attach images; work around uses Outlook, PTW, shared drive]	Attempted, but no indications of success	Successfully pulled up tracks on ITD, but with no labeling
WED 30 APR	Data integrity tested. Evidence points to ADOCS as culprit.	Data integrity tested. ATI.ATR messages unaltered in Target Folders	No indications of success	Successfully pulled up tracks on ITD, but with no labeling
THU 01 MAY	Successful	[TES-N unable to attach images; work around uses Outlook, PTW, shared drive]	Attempted, but no indications of success	Successfully pulled up tracks on ITD, but with no labeling
FRI 02 MAY	Successful	[TES-N unable to attach images; work around uses Outlook, PTW, shared drive]	Attempted, but no indications of success	Successfully pulled up tracks on ITD, but with no labeling

DATE (Guam time)	DIOP to ISRM (CPX), ESSEX RTC (FTX)	File Xfer to ISRM (CPX), RTC / RTC Lites (FTX)	U-2 Msn Plan (to AFSERS TENCAP)	Cross-INT replication fm TES-N to ISRM / RTC
FRI 25 APR	Told by FSRs that sim data from AFSERS cannot be DIOP'd (to ESSEX RTC)	Successful to ESSEX RTC; no exercise data to DDX and vSSN RTC Lites	ISC Hutton (PEO IWS MTT) updated Doc's original plan	Not attempted
SAT 26 APR	Tape of live SYERS mission "played" in TES-N, DIOP'd to ESSEX	Successful to ESSEX RTC; no exercise data to DDX and vSSN RTC Lites	Plan updated by ISC Hutton successfully ingested, used	ESSEX RTC reportedly "pulling" data fm TES-N's Cross-INT database
SUN 27 APR	DIOP'ing tape to ESSEX may have contributed to TES-N non-receipt of sim U-2	Successful to ESSEX RTC; no exercise data to DDX and vSSN RTC Lites	Same plan used	ESSEX RTC "pulling" poss contributed to TES-N database crash
MON 28 APR	Cut ESSEX transfers way back (not much to transfer due to dbase prob.s)	Cut ESSEX transfers way back; DDX beginning to receive	Same plan used, but telemetry not feeding TES-N (EMPS could not "find" sensor)	Could not replicate anything due to corrupted files in Cross-INT filter / databases
TUE 29 APR	Not attempted	DDX RTC Lite receiving all exercise data; not so vSSN	Same plan used, but telemetry not feeding TES-N (EMPS could not "find" sensor)	Not attempted
WED 30 APR	Not attempted	DDX and NUWC RTC Lites both rec'ving exercise data.	Tried ad hoc tasking, but telemetry still not feeding TES-N	Not attempted
THU 01 MAY	All Essex RTC operators aboard Blue Ridge	not pushed today	not tried	Not attempted
FRI 02 MAY	All Essex RTC operators aboard Blue Ridge	not pushed today	Not attempted	Not attempted

DATE (Guam time)	TES-N SCI-SECRET exchange via ISSE Guard
FRI 25 APR	Not attempted; FSR working to set up account for COMINT Analyst
SAT 26 APR	Not attempted; trying to establish SMTP feed of SCI NRTD data from SSES
SUN 27 APR	Not attempted; SMTP feed of SCI NRTD data from SSES in work
MON 28 APR	Not able to further examine; COMINT Analyst conducting self-instruction
TUE 29 APR	Not able to further examine; COMINT Analyst conducting self-instruction
WED 30 APR	Tol d by MTT that special techs had to come set up ISSE Guard
THU 01 MAY	Not attempted
FRI 02 MAY	Not attempted

3.2 EXPERIMENT PLANNED EVENTS

The following are sanitized extractions from the Master Scenario Event List. These events were designed to provide stimulation to Joint Fires Network (JFN) analysts and operators. The events were designed to start slowly and build in complexity to help "players" gradually learn and understand the analytical processes and information flows required to use JFN to support Joint Task Force (JTF) level operations such as Time Sensitive Targeting (TST). The events are designed to stimulate the JFN operators to perform the following operations:

Find and Fix - cross-int analysis to detect, precisely locate, and positively identify TSTs;
Track - enter the TSTs into the Common Operating Picture (COP);
Target - derive aimpoint coordinates and nominate the TST for engagement;
Engage and Assess - monitor the engagement, and conduct preliminary Bomb Hit Assessment / Battle Damage Assessment (BHA/BDA);
Re-Task - support ISR collection plan adjustment during execution;
Re-Engage - support re-engagement of TST as required.

These objectives were gradually introduced, with an initial schedule:

25-27 Apr: Objectives 1-3 only [Find & Fix, Track, Target].
28, 29 Apr: Objectives 1-4 [add Engage & Assess].
30 Apr - 2 May: Objectives 1-6 [add Re-Task and Re-Engage].

The events are laid out by day, with: Event number; target(s) and general location; event start time; ISR data types/sources. A synopsis of the intent of each event is provided, as well as "Smart Notes" (where needed) to indicate specific details needed for the conduct of that event. The following are the planned events by day. The next subsection will describe differences between planned and executed events. All are Guam days.

25 APR - objectives 1-3 [Find, Fix, Track, & Target]

Event FBE FIRES 25-1: Surfaced sub activity

ISR UUV COMINT
ISR UUV ELINT/ESM
ISR UUV EO IMINT.

SYNOPSIS: ISR UUV on station; SIGINT/IMINT cross-correlation. Goal is to have TES-N operators cross-correlate ISR UUV-derived COMINT, ELINT and IMINT/PHOTINT to determine sub is underway, and then pass that as track data over to COP for GCCS-M correlation with E2-C derived surface track/link data.

Event FBE FIRES 25-2: Artillery battery on Tinian

COMINT
ELINT
EO UAV video

SYNOPSIS: continue polishing Find, Fix, Track and Target procedures, this time requiring multiple aimpoints to cover the multiple targets.

26 APR - objectives 1-3 [Find, Fix, Track, & Target]

Event FBE FIRES 26-1: Ground artillery units on Tinian

COMINT
UAV EO video
U-2 SAR imagery

SYNOPSIS: to run through basic flow for Find, Fix, Track, and Target steps, adding in U-2 retasking.

Event FBE FIRES 26-2: CDCM Decoy on Tinian

COMINT
ISR UUV
vSUB ELINT/ESM
EO UAV video
EO U-2 still imagery

SYNOPSIS: vSUB and ISR UUV.

27 APR - objectives 1-3 [Find, Fix, Track, & Target]

Event FBE FIRES 27-1: Ground force C2 node near Tinian airfield

COMINT
open source/HUMINT
EO U-2 still imagery
EO UAV video

SYNOPSIS: continue polishing procedures, adding in open source/HUMINT reporting to the mix.

Event FBE FIRES 27-2: Artillery battery on Tinian

ISR UUV COMINT
ESM
EO UAV video
SAR still imagery using JCA

SYNOPSIS: continue polishing procedures, this time using UUV as COMINT/ESM source, and JCA for receipt of still SAR imagery of target area to verify object locations seen in video, etc.

Event FBE FIRES 27-3: UUV Counter-detection

SYNOPSIS: ISR UUV detects threat emitter (ASW aircraft radar), requiring it to go "sinker".

28 APR - objectives 1-4 [add Engage & Assess]

Event FBE FIRES 28-1: SA-6 on Saipan

COMINT
ELINT several radars
UAV EO video

SYNOPSIS: same as previous events in the Find, Fix, Track, and Target steps, but adding Engagement, and Assessment (initial BHA/BDA).

Event FBE FIRES 28-2: CDCM on Saipan

ELINT of coastal surveillance radar

HUMINT/SOF
U-2 EO imagery

SYNOPSIS: UUV ESM/ELINT tipper. SOF confirm activity, think it may be a decoy, but can't tell due to revetments and/or stand-off range. No UAV available due to maintenance. EMPS operator will need to dynamically re-task U-2 to get rapid "overhead" imagery.

29 APR - objectives 1-4 [add Engage & Assess]

Event 29-1: SA-15 on Saipan

ELINT (three transmissions from three locations -- "looks" and moves)
P-3 AIP EO video

SYNOPSIS: Making "tracking" element more complex by trying to follow mobile SAM's. Also introducing complication of C2 of multi-mission (ISR and others)-capable platforms such as P-3 AIP. P-3 AIP gets "lit up" and shot at by SA-15 but is out of range, so missile misses; SA-15 is engaged; P-3 AIP video enables BHA/BDA by JFN operator.

SMART NOTES: P-3(AIP) must be tasked in ATO for ASW or MARPAT near SAIPAN with track/orbit/operating area just out of SA-15 max range

Event 29-2a: CDCM on Saipan

UUV ESM
ELINT
UUV COMINT/ESM
UUV IMINT/PHOTINT
UAV EO video

and Event 29-2b: a different CDCM on Saipan

UUV COMINT btwn HQ and CDCM unit
UAV EO video

SYNOPSIS: conduct two TST events SIMULTANEOUSLY. Analysts will have to recognize multiple targets exist; ISR Ops will need to adjudicate use of video sensor to PID and conduct BHA/BDA.

SMART NOTES:

(1) COMINT should indicate same HQ, but two different and widely-separated firing units;
(2) Involves only one radar site, supporting both firing units;
(3) BHA should show initial engagement missed one of the firing units.
(4) Geometries of target locations (i.e., CDCM firing unit sites), radar location, and UUV operating box must be carefully considered.

30 APR - objectives 1-6 [add Re-Task and Re-Engage]

Event 30-1: SCUD on FDM

COMINT between HQ and SCUD battery
EO video
U-2 SAR imagery

SYNOPSIS: Re-task of U-2 due to weather (similar to Event 26-1), with engagement and BHA/BDA added.

SMART NOTES:

(1) WEATHER: EO video must show fog/obscuration
(2) U-2(SAR) must be in JTF collection plan, putting aircraft within sensor range, but not yet tasked to collect against that site
(3) U-2 mission plan/collection plan must be built and loaded into EMPS

Event 30-2: SCUD on Saipan
COMINT between HQ and SCUD battery
EO video (obscured by clouds/ground fog)
U-2 SAR imagery
SYNOPSIS: Another U-2 re-task due to weather (similar to Event 30-1), with re-engagement added.
SMART NOTES:
(1) WEATHER: EO video must show fog/obscuration
(2) U-2(SAR) must be in JTF collection plan, putting aircraft within sensor range, but not yet tasked to collect against that site
(3) U-2 mission plan/collection plan must be built and loaded into EMPS
(4) Need COMINT "BDA" inject
(5) Need U-2(SAR) image of "crater" with TEL a few hundred yards away

Event FBE FIRES 30-3: Off-board threat detection
SYNOPSIS: threat emitter (e.g., ASW aircraft radar?) detected off-board of ISR UUV, requiring signal to ISR UUV for it to go "sinker".

1 MAY - objectives 1-6 [add Re-Task and Re-Engage]
Event 1-1: Ground force C2 node on Saipan
COMINT
ELINT
JCA U-2(EO) still imagery
UAV EO video
SYNOPSIS: presence of multiple vehicles and antennae will require multiple aimpoints. JCA U-2(EO) imagery will assist. Weather requires UAV also.

Event 1-2: SA-6 on FDM
ELINT
UAV EO video
U-2(EO) still imagery
and Event 1-3: SCUD on FDM
COMINT between HQ and SCUD battery
UAV EO video
U-2(EO) imagery
SYNOPSIS: Simultaneous pop-up of two targets. SA-6 will complicate engagement matters (e.g., precludes shooting SCUD with TACAIR until it is rendered in-op). Weather cleared.

2 MAY - objectives 1-6 [add Re-Task and Re-Engage]

Event 2-1: SCUD on FDM

COMINT between HQ and SCUD battery
EO video
U-2(SAR) imagery

SYNOPSIS: (re-run of Event 30-1) Re-task of U-2 due to weather. Note SA-6 on FDM (in Event 2-4) will complicate situation.

SMART NOTES:

(1) WEATHER: EO video must show fog/obscuration
(2) U-2(SAR) must be in JTF collection plan, putting aircraft within sensor range, but not yet tasked to collect against that site
(3) U-2 mission plan/collection plan must be built and loaded into EMPS

Event 2-2: SCUD on Saipan

COMINT between HQ and SCUD battery
EO video (obscured by clouds/ground fog)
U-2(SAR) imagery

SYNOPSIS: (re-run of Event 30-2). Another U-2 re-task due to weather (similar to Event 1-1), with re-engagement added.

SMART NOTES:

(1) WEATHER: EO video must show fog/obscuration
(2) U-2(SAR) must be in JTF collection plan, putting aircraft within sensor range, but not yet tasked to collect against that site
(3) U-2 mission plan/collection plan must be built and loaded into EMPS
(4) Need COMINT "BDA" inject
(5) Need U-2(SAR) image of "crater" with TEL a few hundred yards away

Event 2-3: Ground force C2 node on Saipan

COMINT
ELINT
EO video
JCA EO imagery

SYNOPSIS: Re-run of Event 1-1, with adjustments to make sense in context of other simultaneous Events of this day.

Event 2-4: SA-6 on FDM

ELINT
UAV EO video
U-2(SAR) still imagery

SYNOPSIS: Re-run of Event 1-2, but this time with same weather obscuration as in Event 2-1, requiring U-2(SAR) imagery for PID and targeting quality imagery.

SMART NOTES:

(1) WEATHER: EO video must show fog/obscuration

(2) U-2(SAR) must be in JTF collection plan, putting aircraft within sensor range, but not yet tasked to collect against that site

3.2.1 Modifications to Planned Events

During the experiment, there were modifications in event details and also wholesale modifications to accommodate to operator training and expertise. The following lists those modifications.

4/25 The day was devoted to training augmentees aboard Blue Ridge, including reservists and temporary duty personnel on ADOCS.

4/26 Event 26-1 did not occur due to problems with simulation feeds. Participants engaged in process discussions about how to use ADOCS. Event 26-2 feeds into JFN occurred as planned. TST processing was hindered by internal communications difficulties.

4/27 Event feeds into JFN occurred as planned. Target nominations could not be made from TES-N due to problems with TES-N database. Nominations were manually entered from JIC ADOCS.

4/28 Events were not conducted due to continued problems with TES-N database. Fires participants conducted meetings to develop/refine TST-ADOCS procedures. Major focus was on defining color-coding conventions for ADOCS TST and Fires Managers.

4/29 - 5/02 Events run as planned.

3.3 DAILY CONTEXT SUMMARY

The following are summaries of the important context for each day. This context frames each day's events and provides some insight into cause-and-effect for that day's results.

4/26 Due to all the impacts on the experiment described above, TST processes did not go smoothly during the first FBE exercise day from 0700-1500 local. However, the difficulties and the co-location of most of the players aboard Blue Ridge prompted a very productive wrap-up meeting in which important insights arose.

A simple question from one of the participants evolved into a very productive discussion about TST process. Up until this discussion, the people with previous experience FBE Fires, JFN, and ADOCS experience couldn't prescribe TST processes that hadn't been approved by C7F. Instead, much was being left for the augmentees to discover and define a process that (in theory) would work aboart the C7F flagship. That wasn't happening. Hardware and software weren't functioning as intended and all the FTX augmentees really didn't know enough to figure out what it was they were supposed to do.

Furthermore, when one of the people with previous FBE Fires experience sketched a block diagram on a whiteboard to try to clarify the ADOCS processes, everyone nodded except the C7F Fires lead. Basically he said that the process and roles of JFMCC and JFACC as sketched were not what C7F wanted. The fundamental issue, that hadn't been well understood,

and was the reason that there wasn't an approved CONOPS going into the FBE, was that as a Joint Task Force Commander, C7F wanted to use his supporting Joint Forces Air Component Commander to be in charge of TSTs. C7F did not want his physical location afloat to dictate a JFMCC-centric TST process.

During the next hour, an executable process emerged that had the concurrence of C7F, the JFACC TST personnel and the Navy people in the Xray Papa cell. A contentious change to the pre-planning for FBE Fires was that all Navy Strike aircraft (all of which were simulated FA-18s) and their airborne command and control post, the virtual experimental E-2 were apportioned to the JFACC -- leaving the Navy Strike Warfare Commander, Xray Papa with no Strike aircraft. The only FBE-K Strike assets that Xray Papa (on behalf of the JFMCC) still owned were the vDDX and the vAnzac.

4/27 TES-N problems plagued events. Both JFN MSELs were executed, but TES-N couldn't make nominations, couldn't pass targets to GCCS-M, and couldn't chip images to PTW which would have enabled the operators in the JIC to save images to a local hard-drive for e-mail dissemination. With can-do spirit the JIC people did work-arounds and manually nominated targets thru their ADOCS.

ADOCS operators reported that ADOCS was almost fatally slow between when the operator clicked the mouse and when the computer responded. Delays were on the order of 2-4 minutes. This apparently had to do with the ADOCS being run on the ship's existing Secret LAN on existing PCs.

Another process evolution occurred this day during the end-of-day post-mortem concerning "Collection Management." It had been assumed that the CJTF Collection Manager was in the JIC, but the consensus was to push CM back to JFACC ("back" in the sense that it would go to JFACC Rear if they were there). For FTX, it would actually be done by one of the Air Force officers in the JFACC TST cell in Blue Ridge, pretending he is the Collection Manager in the JFACC AOC.

4/28 TES-N problems continued. TES-N still couldn't make nominations or pass targets to GCCS-M. The ability to chip images to PTW for saving on a shared-drive was restored. The JIC continued to manually nominate targets in ADOCS, and they instituted an "exercise-exercise-exercise" intelligence report to disseminate via e-mail. TST process development focused on standardization and common understanding of ADOCS block color-coding.

4/29 Systems, TES-N and ADOCS, worked. Target nominations were made from TES-N. The TST process flowed.

Undisciplined Chat usage for UAV coordination lead to two UAVs being sent to the same point to look for the same target at one time (instance of the need for tactical Chat procedures).

4/30 The ADOCS-based TST command and control procedures worked out since the start of FTX were working smoothly this date. People had a pretty good common understanding of what color blocks meant what, and who was responsible for various actions.

5/01 The exercise day was delayed in JIC due to problems with the ship's Secret LAN.

Accordingly, there was no ADOCS, no chat, no SIPRNET e-mail, etc. until problems were resolved.

5/02 Mostly routine MSEL injects and processing. One particular sequence was noteworthy: Background: Two SCUD TELs (with stowed missiles) were found with TES-N, nominated into ADOCS, and processed for engagement. An engagement was conducted and BHA requested. There was no indication of hits anywhere near the target. Everything was pretty routine up to here, then got interesting. The UAV then saw the TELs relocate a very short distance and erect their missiles for launch. The command and control processing then became confused. The immediate choices available were to consider the TELs in their new position erected for launch as new TSTs, or consider them re-strikes of targets already on the Joint TST list. Superficially, this can be considered as merely a TTP or SOP issue. But either choice has some disadvantages. This points to some issues about how ADOCS functions, and suggests some other functionality is needed for the prosecution of TSTs using ADOCS. This is discussed further in the following section on consequences.

Coalition Daily Context:
4/27 ADOCS terminals in JFMCC/XP cell were attached to the network at 10 Mb/s. This resulted in very slow performance which was compounded by operators repeating keyboard and mouse functions since there was no visual feedback similar to a MS Windows hourglass symbol indicating that the computer had accepted the command.

ADOCS times were one hour behind Guam time due to network program overriding local computer time and automatically setting ADOCS clocks to Yokuska time.

GCCS-M was displaying multiple tracks due to a problem with real world nodes not properly using full UIDs in processing of tracks (thus having no way to correlate the same track reported from multiple sources.

4/28 ADOCS time problem continued and was not corrected for the rest of the experiment.

4/29 There were occasional ADOCS server lockups. The ADOCS remarks field for each target was of limited size, and not enough information could be passed about the target in some cases.

5/1 Target Weapon Pairing (TWP) is not working correctly. An operator would bring up a weapon list for a target, and the availability time of the weapon would not always overlap with the time window of the target. The explanation we received from ADOCS techs was that there was no JMIMS data as there would be in an operational environment.

3.4 SUMMARY CONTEXT CONSEQUENCES:

The main impact created by the above noted difficulties, with regard to meeting this initiative's objectives, was that JFN was operated in an artificial environment. Procedures were not what is or will be used for TST, hence evaluation of these procedures to determine JFN's contribution will have marginal validity. The experiment was decoupled from the exercise.

Many critical elements of the TST process were artificial:

- Cross component coordination and deconfliction
- Inter-platform communications
- Positive ID
- Collateral Damage Estimate
- Aimpoint Geo-refinement
- Collection Management

TES-N operator training conducted during the CPX leading up to the FTX was apparently successful in getting the JIC imagery analysts comfortable and competent at their multi-function workstations.

4.0 ANALYSIS APPROACH

Here we describe

- decomposition of the two initiatives that make up the Fires portion of FBE-Kilo,
- C2 structure tested,
- analysis methodology, data, and tools, and
- CONOPS and TTP.

This forms the basis for understanding the data and processes used to reach the Report's conclusions. Actually, for the reason stated in the next paragraph and reasons found in the body of this report, this section contains only a rudimentary description of what was to be done from the experiment.

The reader will note that this section is somewhat skimpy. This is because there is little data to analyze from this experiment. Rather than analyze data and information to produce quantitative and qualitative results about processes and systems, the analysis has reverted mainly to identifying what went wrong and recommendations for future improvements.

4.1 INITIATIVES DECOMPOSITION

Basic initiatives decomposition is given by the questions presented earlier. Here we further decompose by correlating questions with the data needed to address them.

4.1.1 TST Processes Initiative Decomposition

Four questions have been presented above for this initiative. The first deals with:

- how the particular FTX architecture affects the functioning of the JFN suite.

The next four questions deal with TST CONOPS or SOP with regard to:

- CONOPS/SOP adequacy.
- Interaction between CONOPS/SOP and systems.

In order to address these issues, it is necessary to determine how well the various sub-processes within TST are functioning and what support is being provided by JFN to carry out those processes. It is further necessary to determine how the processes are addressed in pertinent CONOPS and SOPs.

The decomposition needed is to break down the TST process into identifiable processes. The initial breakdown is:

- Find
- Fix
- Track
- Target
- Engage
- Assess

Further breakdown that shows sub-processes and the organizations/people that perform them is required. This is done for a complete, fully functional, JFN suite in Appendix E. It is done for the particular configuration that was used for FTX in the following Section 4.2.

4.1.2 Coalition Initiative Decomposition

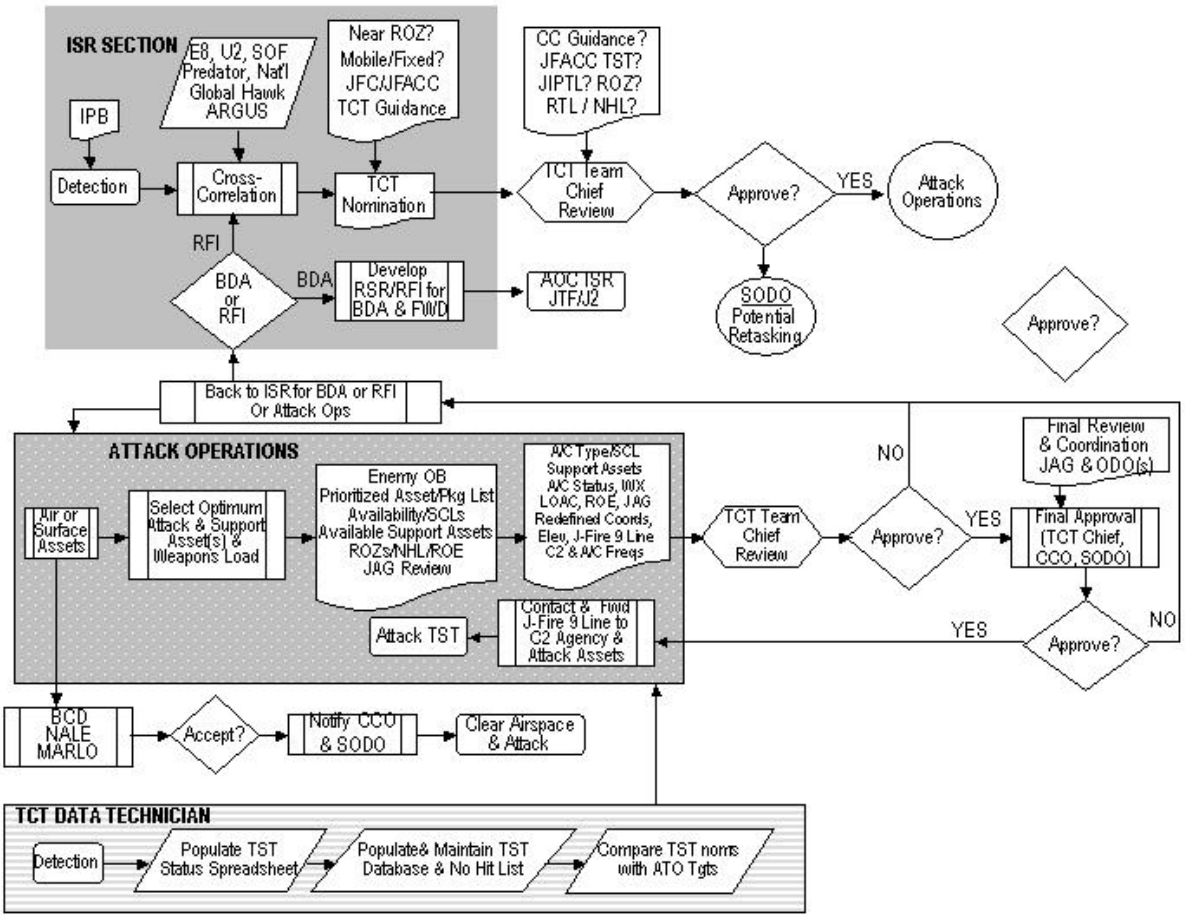
Rather than decompose the Coalition Initiative, its relationship to data is best expressed by a simple question:

Are the information presented in the U.S. COP and the Coalition COP the same?

The data needed for this evaluation is track information on either side of the Radiant Mercury filter.

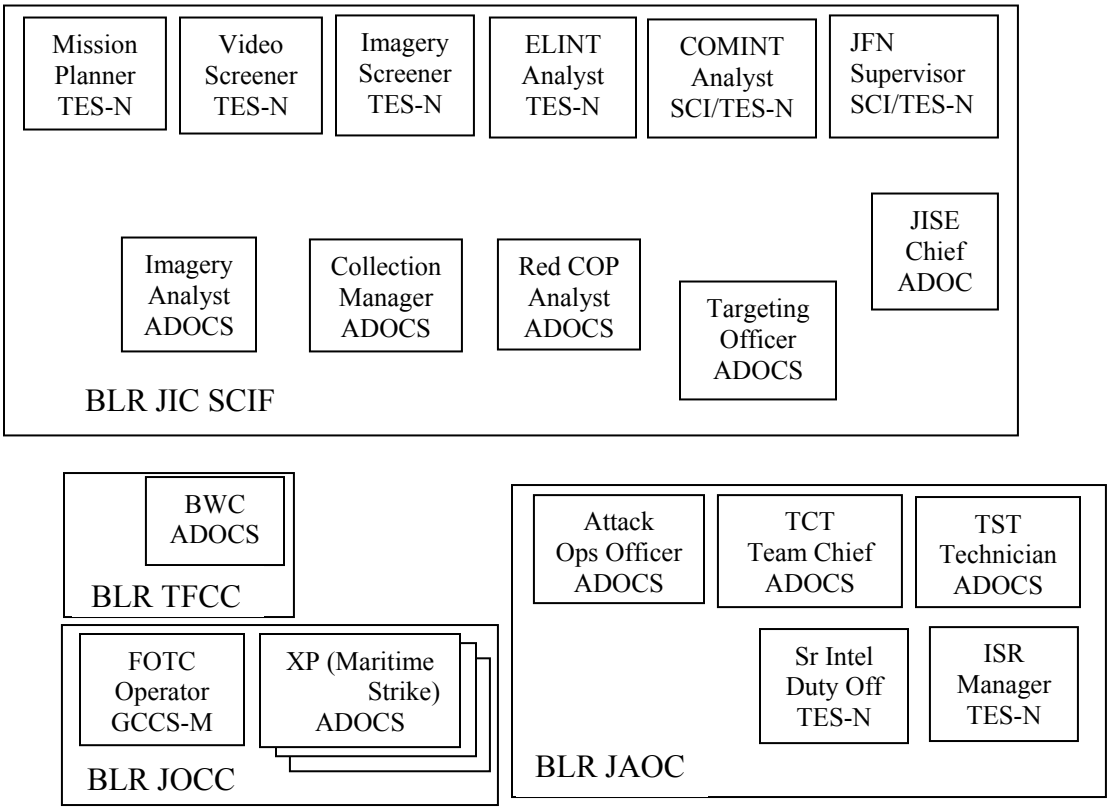
4.2 EXERCISE TST STRUCTURE

The TST process is outlined in the Experiment Plan with the following PACAF SOP figure:



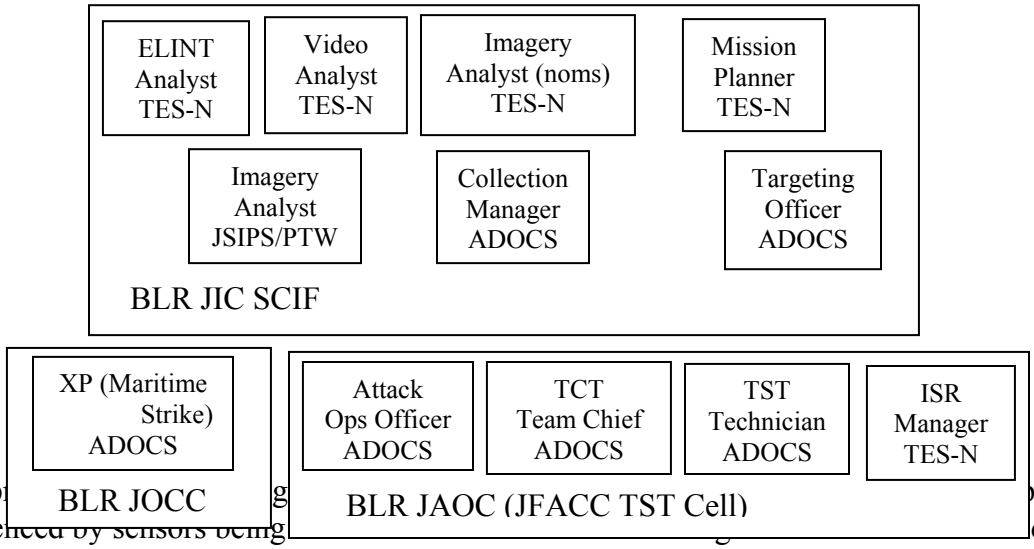
It was planned to support the TST process with the following distribution of functions and

supporting systems, (figures from the Experiment Plan).



4.2.1 Experiment TST Structure Executed

The above diagrams show the structure for the FTX exercise. Due to the various difficulties noted earlier in this report, the structure for the FBE-K experiment was not the same. The following shows the organizations, functions, and supporting systems actually used.



The p[illegible] partly influenced by sensors being [illegible] directly with the Video Analyst and with Sensor Controllers. This bypassed the ISR Sensor Manager

much of the time. The ISR Manager attempted to coordinate with the JIC Collection Manager, but through e-mail and Chat. In order to have a more streamlined process, it was arranged to have the Video Analyst communicate directly with the Sensor Controller.

The XP Cell played an active role, but with a large degree of artificiality. People played the roles of JFMCC, JFLCC, etc., in order to have their staff input represented. There was no real JFMCC coordination (recall that this was the experiment, not the exercise). XP interactions with the JAOC was largely work-arounds to have a functioning process for the experiment, not to represent realistically real-world operations.

4.3 ANALYSIS METHODOLOGY, DATA, AND TOOLS

Former FBE Fires initiatives have placed most of their emphasis on the TST timeline. How rapidly the detect-to-engage cycle could be performed was of primary interest. That is not the case in this experiment, so timelines will receive only cursory attention. As noted above, interest her is on how well sub-processes, or tasks, can be performed.

Task performance assessment is normally done in four ways:

- Participant surveys.
- Expert observers monitoring nodes in the process.
- Determination of task performance times.
- Determination of task performance capacities.

The first two are subjective and the last two are quantitative, providing statistics, best performance, and correlations between situation and performance (case studies).

Because of the various difficulties encountered in FBE-K, the last two assessment methods could not provide useful results. Times and capacities were strongly influenced by the need to develop and use work-arounds. Thus, results produced would be indicative of processes that had little to do with the initiative. An even greater difficulty is that processes and tasks were often interrupted by equipment failures or the need to compensate on-the-fly for missing information.

The survey tools used are presented in Appendix F. Summaries and interpretation of survey results are in the Results section.

4.4 DATA STRUCTURE

The table below outlines the essential TST event data that ideally should have been collected from the various Fires systems, and those that actually were collected, in FBE-K. The gap between what was desired and realized is substantial. Measures that would go far toward removing such discrepancies in future experimentation include:

- A requirement for system participation in an experiment is the system incorporation of tools that would log, identify and timestamp all significant operator actions.

- Data logging in a format that is easily manipulated for post experiment analysis.
- Pre-experiment integration testing include the validation of the data logging applications as an objective.

The data that would be captured by such logging tools are necessary for: an objective analysis of the engagement process, the assessment of the contribution of individual systems to the engagement process and the evaluation of the performance of individual operators.

Another essential aspect of objective data collection is the time synchronization of all participant systems. The data from FBE-K show that the IRC and ADOCS time stamps were several minutes out of synchronization.

Required and Realized TST Engagement Event Data from FBE-K

Event	System	Collected in FBE-K?	Comments
Target sensing	JSAF	N	For simulated sensings
Target detection	GISRC, TES-N	N	Track creation
Target nomination (start)	GISRC, TES-N	N	
Target nomination (complete)	GISRC, TES-N	N	
Nomination transmitted	GISRC, TES-N	N	
Nomination rec'd	ADOCS	Y	Rec'd time in Mission History and on Targeting tab often disagree.
Nomination rec'd	PTW	N	
Weapon-Target Pairing	ADOCS	Y	
Request georefinement	ADOCS	N	Georefinement not a factor in FBE-K
Start georefinement	PTW	N	
Complete georefinement	PTW	N	
Georefinement result transmitted	PTW	N	
Georefinement result received	ADOCS	N	
Coordination block actions	ADOCS	Y	Many events. Inconsistencies in many cases in the ADOCS data
TLAM route request	ADOCS	N	
TLAM route request received	RPM	N	
Initiate route computation	RPM	Y	
Route computation complete	RPM	Y	
Transmit route	RPM	Y	
Route received	ADOCS	N	
Fire When Ready (WRD)	ADOCS	Y	

Fire command	ADOCS, JSAF	Y/N	SNN did not log Fire events
Impact	JSAF	Y	Gaps in the data
BDA report	ADOCS	Y	

4.5 CONOPS AND TTP EMPLOYED

Neither CONOPS nor SOP were available for TST processes that matched the C2 processes for FBE-K. It was decided to use, as much as was practical, the draft PACAF AOC SOP. The pertinent section of that document to this experiment is Annex F to Chapter 6, Time-Critical Targeting Team. A description of actions performed by the ISR Section and Attack Operations and a summary of the essential elements of the process follows.

4.5.1 ISR Section

The principal role of the ISR Section during TCT operations was to lead the Find, Fix, Track, and Assess functions of the F2T2EA kill chain. Figure 3 provides a Information Flow diagram of the ISR Section observed during TT03. Key functions of ISR Section observed during TT03 include:

- Conducted Predictive Battle Space Analysis (PBA) for TCT based on Intelligence Preparation of the Battlespace (IPB) conducted for deliberate planning/ATO generation. [Note: PBA was notional during the exercise. Discussions between TCT ISR Section at AOC and JTF ISR staff on BLUE RIDGE was limited during the CPX]
- Conducted dynamic sensor re-tasking for those assets not under direct collection management authority of the TCT team.
  [Note: TT03 process required ISR Section to request sensor re-tasking through the JECG and USS BLUE RIDGE. In real world, the SIDO would have capability/authority to reposition sensors to Find/Fix TST. If JFACC were afloat then ISR Section would have reach-back capability to support dynamic sensor re-tasking].
- Tracked ISR data and provide TST nomination to the TCT Chief for valuation
- Coordinated with external agencies to fully integrate all possible ISR capabilities in support of TCT (ELINT, COMINT, HUMINT, IMINT)
- Ensured track quality and geo-location support desired weapons options and address any ID conflicts
- Tracked TST's throughout TST "life-cycle" and maintain situational awareness on all active TST's.
  [Note: Intelligence information regarding TST's was shared between the BLUE RIDGE TES-N and AOC ISR-M.]
- Provided support to Attack Operations Section during target pairing function against a particular TST (e.g. Collateral Damage Assessment (CDA), Refined Mensuration) [Note: In reality the AOC (TST Authority) ISR Section would conduct CDA and target mensuration prior to forwarding TST nomination to Attack Operations, however, during TT03 CPX, CDA

was requested from the JECG and target mensuration was sometimes conducted on USS BLUE RIDGE before sending imagery from TES-N to ISR-M (AOC) for TST engagement]
- Compared nominated TST to daily ATO target list
- Coordinated Phase II BDA
  [Note: SIDO did not have control of ISR assets during the exercise. During TT03, all BDA requirements were coordinated through the Joint Experiment Control Group (JECG) and ISR Cell on USS BLUE RIDGE]

4.5.2 Attack Operations Section

The principal role of the Attack Operations Section during TCT operations was to lead the target and engage function of the F2T2EA kill chain. During TT03, the Deputy CCO was tasked as the Attack Operations Chief with responsibility of coordinating support required to successfully attack nominated TST with AOC personnel (Airspace Management, IO, Tanker Cell, JAG, Joint liaisons, etc.). Figure 4 provides a Information Flow diagram of the Attack Operations Section observed during TT03. Key functions of Attack Operations Section observed during TT03 include:

- Received the approved TST nominations from the TCT Chief and coordinated with the ISR Section (Targets) to develop a list of available assets capable of attacking the target.
- Coordinated with AOC liaison elements (Battlefield Coordination Detachment (BCD), MARLO, NALE, SOLE, for availability of alternative attack options for TST engagement/attack. [Note: MARLO or SOLE representatives did not participate]
- Coordinated with IO Cell for potential non-kinetic kill solutions. [Note: This was not observed during TT03 but step was identified during discussions with TCT Chief and Attack Operations Chief]
- Provided TCT Chief with a prioritized attack asset list and package options for TST.
- Provided TCT Chief with JAG perspective on TST's prior to requesting final approval from JFACC for engagement.

4.5.3 TCT Process Summary

1. Based on Commander's Guidance, ISR assets will be resourced on ATO. Emerging targets (ELINT, COMINT, HUMINT, IMINT, etc.) commence TCT process.
2. Ensure TST Targeting Matrix and ROE is available at JIC (BLR), JAOC TST Cell (BLR) and AOC TCT Cell (Hickam)
3. As tippers (sensor cues) flow in from a variety of sources, the ISR Section (SIDO) prioritizes which targets are potentially valid TST's. The SIDO enters potential targets on the 'Emerging Target List' and requests the track data manager to create a JTIDS 3.5 track if a JSTARS unit has not already created. The track data manager in the ISR Section will work with the Joint Stars Work Station (JSWS) operator to ensure tracks are created, updated, and dropped as appropriate.

[NOTE: During TT03, AOC TST Cell (Hickam) received initial target nominations from the ship and acknowledged receipt to the JAOC TST Cell (BLR) via IWS Chat, SIPRnet email or Voice Comm]

4. Targets not categorized as TST's will be forwarded to the Senior Offensive Duty Officer (SODO) for potential retasking of current ATO assets to accommodate, or processed back through Combat Plans for inclusion in subsequent ATO's.
5. SIDO directs TCT personnel (targets and current situation) to conduct a Predictive Battlespace Analysis (PBA) based on sensor cue(s). PBA could be considered a more refined IPB of the specific TST location. Collateral damage assessment is conducted to ensure TST engagement will not violate Commander's Guidance or ROE.
6. SIDO directs Collections Manager to modify collection plans, as required to cross-correlate initial sensor contact. SIDO must coordinate with TCT Chief and CCO prior to re-tasking sensors on current ATO.
7. SIDO evaluates sensor data collected. If target is a TST identified on Joint Integrated Prioritized Target List (JIPTL), the SIDO will nominate the target to the dynamic target list.
8. After a target is nominated to the dynamic target list, the TCT Chief will assign the target a team in the Attack Operations Section.
   [NOTE: Real world operations typically include three attack coordination teams to handle multiple high priority TST's simultaneously. CCO and TCT Chief will adjust the number of teams as required by the operational tempo. Instead of creating teams with stovepipe focus (geographic areas or specific target sets), each team should be able to flex to any geographic area/target set as directed by the SIDO and TCT Chief]
9. The attack coordination team is responsible for friendly deconfliction, coordination with SOLE/BCD/MARLO for attack options, asset nomination based on threat, weather, response time, weapons effect, airspace deconfliction, Positive Identification (PID), Rules of Engagement (ROE), and point mensuration, as required.
10. The attack coordinator works closely with the Targeteer (ISR Section) to ensure mensuration and collateral damage assessment is conducted and current; then completes an electronic checklist for the attack as posted on the shared view of selected chat room application. When data form is complete, the attack coordinator presents the attack plan to the TCT Chief for approval. The TCT Chief will review and present recommendations to the CCO, AOC, and JFACC.
11. In parallel to the attack option development, the SIDO coordinates with Collections Manager and Current Situation to identify ISR resources required for a Phase II BDA and plans BDA mission(s), if required. The primary BDA will be conducted and verified by platforms conducting the strike (Phase I). However, if Phase I BDA is unsuccessful, the SIDO will provide recommended approach to dynamically retask assets to conduct Phase II BDA.
12. Once the TST strike package is approved by the JFACC, the TCT Chief directs the C2 duty officer to pass the tasking via SATCOM TCT net to the C2 package Commander in the aircraft.
    [Note: All approved strike packages were forwarded through JECG during TT03 CPX]
13. The attack coordinator ensures the strike package/target information is forwarded to the appropriate duty officer (track data manager) to pass up to the attack aircraft.

[Note: Assumes that weapon target pairing is Air Force strike aircraft.]

14. The track data manager sends a 9.0 tasking message to the aircraft and works with the surface track coordinator and the JSWS operator to ensure the track is updated with accurate coordinates and elevation.
15. The C2 Commander on Aircraft will conduct Phase 1 BDA and pass information to the C2 Duty Officer who informs TCT Chief of the results.
16. The TCT Chief coordinates with the SIDO, CCO and JFACC to decide if Phase II BDA or re-strike option is required.

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5.0 RESULTS

As was stated in the Reconstruction section, FTX results were strongly influenced by equipment and manning issues. This makes it difficult to provide any results concerning TST processes. Thus, the focus here is not only on answering initiative questions by also includes a significant amount concerning equipment and experimentation improvements.

5.1 COALITION INITIATIVE RESULTS

5.1.1 Coalition Results Details and Summary

The following table presents the FTX MSEL targets used to compare US and Coalition ADOCS mission histories. Mission histories are created in ADOCS, which lists the steps taken to prosecute a target. They are listed by time and give an historical view of when an event, such as the firing of munitions, happened. The targets were chosen based on description and location stated in the MSEL. Exact coordinates and times were not given.

The table compares data from Blue Ridge, Coalition and ANZAC with data from Newport. Data was not recorded for Newport on April 29, 2003. Coalition data was not recorded on April 30, 2003. And there was no data from ANZAC from April 28 to May 1, 2003. Blue Ridge data was used to compare with Coalition data on April 29, 2003 in lieu of the unrecorded Newport data. Blue Ridge and Newport ADOCS are central to the other ADOCS involved in the experiment and are assumed to have the same data. Targeting coordinates, discussed in the table, were retrieved from the Fire Mission menu in ADOCS for the specific target.

Target Mission History Comparison with Newport (NPT) ADOCS

MSEL	Target	Blue Ridge (BLR)	Coalition	ANZAC
28-1	AB0021	Mission history similar to NPT, except for an extra line in BLR	No mission history. Targeting coordinate is the same as NPT, located on water. Coordinate was later changed in NPT, but did not update in Coalition ADOCS. Same acquisition time.	No data collected from ANZAC
	AB0022	Mission history same as NPT	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
	AB0023	Mission history same as NPT	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC

	AB0024	Target not in BLR data	No mission history. Targeting coordinate was changed in NPT, looks like the same location on map between Coalition and Newport. Same acquisition time.	No data collected from ANZAC
	AB0027	Mission history similar to NPT, except for two lines in BLR	Restrike of Target # AB0024. No mission history	No data collected from ANZAC
29-1	TB0039	No data collected from Newport	Target not in Coalition, using BLR data to compare	No data collected from ANZAC
	TB0040	No data collected from Newport	Target not in Coalition, using BLR data to compare	No data collected from ANZAC
29-2 a/b	AB5002	No data collected from Newport	Target not in Coalition, using BLR data to compare	No data collected from ANZAC
	AB5007	No data collected from Newport	Target not in Coalition, using BLR data to compare	No data collected from ANZAC
	AB5012	No data collected from Newport	Target not in Coalition, using BLR data to compare	No data collected from ANZAC
	AB5013	No data collected from Newport	Target not in Coalition, using BLR data to compare	No data collected from ANZAC
	TB0042	No data collected from Newport	No mission history. Targeting coordinate same as BLR data. NLT time not updated	No data collected from ANZAC
	GE0149	No data collected from Newport	No mission history. Targeting coordinate and time same as BLR data.	No data collected from ANZAC
30-1	TB0051	Mission history details in BLR is not all in NPT ADOCS	No data from Coalition	No data collected from ANZAC
30-2	AB5037	Mission history similar to NPT, except missing two entries from BLR. Entries same times, out of order between NPT and BLR	No data from Coalition	No data collected from ANZAC

	TB0052	Mission history details in BLR is not all in NPT ADOCS	No data from Coalition	No data collected from ANZAC
	TB0053	Mission history details in BLR is not all in NPT ADOCS	No data from Coalition	No data collected from ANZAC
1-1	GE0164	Mission history same as NPT	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
	TB0059	Mission history details in BLR is not all in NPT ADOCS	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
1-2	AB5072	Mission history same as NPT	Target not in Coalition data	No data collected from ANZAC
	AB5073	Mission history same as NPT	Target not in Coalition data	No data collected from ANZAC
	AB5074	Mission history similar to NPT, except for an extra line in BLR	Target not in Coalition data	No data collected from ANZAC
1-3	GX0312	Mission history similar to NPT, except for extra entries in BLR	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
	GX0314	Mission history similar to NPT, except for an extra line in BLR	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
	GX0316	Mission history same as NPT	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
2-1	GX0337	Mission history details in BLR is not all in NPT ADOCS	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC
	GX0338	Mission history details in BLR is not all in NPT ADOCS	No mission history. Targeting coordinate and time same as NPT data.	No data collected from ANZAC

	GX0341	Mission history similar to NPT, except for two lines in BLR	No mission history. Targeting information in Coalition has more detail that in NPT mission history. This may be part of another mission, GX0338 based on similar time frame and coordinates.	No data collected from ANZAC
	TB0065	Mission history details in BLR is not all in NPT ADOCS	No mission history. NPT mission history has limited information. Cannot compare coordinates and time with Coalition targeting information.	No data collected from ANZAC
2-2	AB5088	Mission history similar to NPT, except for the order	No mission history. Targeting coordinate and time same as NPT data.	Target not in ANZAC data.
	AB5089	No mission history	No mission history. NPT has no mission history to compare to Coalition. This is a restrike of TB0063.	Target not in ANZAC data.
	TB0063	Target not in BLR	No mission history. Targeting coordinate and time same as NPT data.	No mission history
	TB0064	Mission history details in BLR is not all in NPT ADOCS	Target not in Coalition data	Target not in ANZAC data.
2-3	AA0370	Mission history similar to NPT, except for an extra line in BLR	Detailed mission history in Coalition. NPT mission history is limited to status changes.	Detailed mission history in ANZAC.
	AA0373	Same as NPT, BLR mission history is limited to 2 status changes.	Detailed mission history in Coalition. NPT mission history is limited to 2 status changes.	Detailed mission history in ANZAC.

Comparing Newport target mission histories with Blue Ridge's mission histories shows that there are differences between the two US ADOCS. Some mission histories for the same target between Newport and Blue Ridge were similar except for one or two lines. At other times, such as target TB0065, not all information is shared between the two systems. However, the information that is shared is the same.

Comparing the same Coalition targets to US targets shows that complete mission histories is not exchanged between US and Coalition ADOCS. Most of the targets did not have any mission histories in Coalition. It was not until MSEL 2-3, targets AA0370 and AA0373, that Coalition had mission histories; but only a few lines of over 20 lines in Coalition were exchanged with the US ADOCS for both targets.

Tabulation of Mission History (MH) Comparison			
	Blue Ridge	**Coalition**	**ANZAC**
Different MH compared to NPT	17	21	3
No Targets	2	10	3
No Data	8*	4	29
MH similar to NPT	8	0	0
Total MSEL Targets	35	35	35

* No data from Newport to compare with Blue Ridge data.

Missing targets and mission histories may be attributed to Radiant Mercury Guard (RMG). Radiant Mercury Guard acted as a filter of information exchanged between US and Coalition. However, there are other issues that could affect the data. Based on the descriptions of problems observed, there are several possible reasons that discrepancies could exist in the ADOCS data according to Gary O'Neilin of General Dynamics:

1. Network problems may have occurred, though this is the most unlikely one because of the way ADOCS Communication Server works. When the connection between two ADOCS nodes is broken, the sending nodes queue up all messages going out to the node that is down. When the connection is re-established all the messages to include the messages that may have been sent during disconnection are resent.

2. Not all locations see every mission. It is dependent upon the way the architecture is set up. In most FBE architecture there is one ship that sees all missions that are going to be fired; in this case it was the Blue Ridge. The E2X, DDX, Coalition and ANZAC were to my knowledge shooters; this means they only see missions that are pushed to them by the Blue Ridge or missions that are detected by their organic sensors. There is no reason for every shooter to see every mission and most commanders don't want to see things that they have no control over. It just clutters up their picture and muddles their mission.

3. The resetting of the databases could be a cause of the problem if network connections were dropped prior to all the messages being sent to the proper location for backup.

4. There has been a problem detected with mission history in the newer versions of ADOCS, but confirming it in the version that was used in the FBE-world has not been done. The problem appears to cause additional lines of text from one node as well as shows the mission history in various orders between nodes even when using the same viewing type such as Time.

In closing since I was not present at FBE it is very hard to determine the exact cause of loss of data, but in previous FBEs I have done, the above items have been some of the things that have given us grief."

Despite missing targets and incomplete mission histories from the ADOCS data, vANZAC COP was adequate to support engagement. Based on observations made by Dr. Darren Sutton in the Coalition cell, vANZAC was aware of all surface and ground targets within ADOCS. Their awareness was also made possible through chat and GCCS-M.

The reasons for missing targets and incomplete mission histories have not been identified; they may have been caused by network problems and multiple instances of ADOCS down times as stated in section 5.1.2. RMG may also have contributed to the missing data.

To prevent future data problems ensure that network problems and ADOCS issues are corrected. Future data collection should be coordinated between the users of ADOCS using agreed upon format. These actions would facilitate proper analysis of the fires processes.

5.1.2 Coalition Participants Fires Observations

The following are the observations of CMDR Cunningham, RAN and CDR Davis, USNR

Tuesday, April 29, Observations

1. According to Coalitions Fires in NPT, if VANZAC edits ANZ tab (Missions Coordination Manager) it fires the mission. They aren't editing the ANZ tab.
2. FDR Block (Missions Coordination Manager) stayed yellow on BLR ADOCS side. Coalition Fires side of ADOCS after weapons release was showing green. Target was TB0041.
3. VANZAC requested guidance on number of ERGM rounds to fire. Cannot specify number of rounds in ADOCS. Does unit or XP determinate the number of rounds to fire.
4. VANZAC was unclear on tab protocol. XP developed and disseminated tab protocol during the exercise, but tab protocol/documentation required prior to STARTEX to clarify requirements for exercise participants.
5. VANZAC intermittently dropped out of GCCS.
6. Air gap latency didn't appear to hinder VANZAC response to chat.
7. VANZAC achieved chipped image electronic transfer into FBE-K target folders at NPT for web dissemination.
8. Multiple ADOCS system down times hindered play. Chat successful in engineering work around during ADOCS outages.

Wednesday, April 30, Observations

9. Fires Mission Manager FRD tab doesn't turn green after vANZAC fires.
10. Fires Mission Manager E2X, DDX, ANZ, ADC and JIC tabs reset to white for every RMG transmission – work around is for ADOCS operator BLR to edit tabs.
11. JTST Manager MSN tab is not turning to green when weapon is released.
12. Not able to select weapons-target pairing from options menu – unable to assign ANZAC-ERGM weapon-target pairing for AA0305.
13. Two targets (AB5035 and AB5035) result from the re-nomination of AA0305.
14. ADOCS JOC Station 3 is unstable.

Thursday, May 1, Observations

15. Multiple ADOCS system down times hindered play. Chat successful in engineering work around during ADOCS outages.
16. Air gap latency didn't appear to hinder VANZAC response to chat.
17. Confirmed that RMG interchange between high and low sides deleted EZX, DDX, ANZ, JIC, and ADC tabs information in Missions Coordination Manager with each transmission. Work around is for low side to pen and paper ADOCS play while high side communicates process via chat and updates ADOCS.

Friday, May 2, Observations

18. Multiple ADOCS system down times hindered play. Chat successful in engineering work around during ADOCS outages.
19. XP distributed refined process (including tab) protocols. The refined protocol was used to prosecute targets.
20. Air gap latency didn't appear to hinder VANZAC response to chat.
21. RMG interchange between high and low sides continued to delete EZX, DDX, ANZ, JIC, and ADC tabs information in Missions Coordination Manager with each transmission. Work around is for low side to pen and paper ADOCS play while high side communicates process via chat and updates ADOCS.
22. RMG interchange problems detracted significantly from vANZAC participation in an engagement mode in the fires network.
23. BLR network didn't appear suitable to host ADOCS. Slow speed of ADOCS and system crashes prevented full utilization of the system.
24. Although air gap latency didn't significantly hinder communications with vANZAC, the use of a third party "air gap" was cumbersome and did result in ambiguity.

Amplifying information:

- Occasionally, use of the zoom function caused the ADOCS system to crash.
- ADOCS map updates occurred every 3 minutes. This was not fast enough in some cases.
- How does one know when a target has been pushed to them?
- ADOCS computer setups should be standardized.
- The chat room rules were not adequately established.
- ADOCS was not providing indication of target being hit fast enough to allow efficient control of ISR assets for BDA.

5.1.3 Coalition Partner Observations

While coalition partner observations occurred at two widely geographically separated locations, at the Defense Science and Technology laboratory in Fern Hill, Australia and the Navy Warfare Development Command Modeling and Simulation laboratory in Newport, Rhode Island, a single combined set of observations is presented here. This is reasonable because, at least for ADOCS, both locations were, in theory and as far as was tested during execution in practice, viewing the

same data. It is however important to note that there were differences in the situational awareness at the two sites resulting from access, or lack of it, to other systems at the two sites. GCCS-M and GISRC were available in Australia, but not in the Coalition Cell in Newport, while US SECRET NOFORN network including Web pages, IRC chat and Voice over IP (VoIP) were accessible to the coalition in Newport, but obviously not directly in Australia.

Given the detailed reporting of technical observations related to the coalition initiative elsewhere in this report the following observations are reported in summary form.

C4I Systems

ADOCS Integration: The key technical issue facing the coalition was its 'seamless integration' as a node within a distributed fires network. While some level of integration was achieved it was certainly not seamless and this was most evident with ADOCS, which was intended to be the principle tool to support the command and control of nodes in the fires network.

Despite continued efforts throughout both the final operational sequence diagram (OSD) testing period and the rehearsal period between the CPX and FTX phases the full integration of ADOCS across the boundary between the SECRET US NOFORN and SECRET AUSCANUKUS Releasable networks was not achieved.

While the majority of the problems initially observed during final OSD testing were resolved, others, including most notably the over-writing of the colored boxes in the Fires Manager, did not become apparent until execution, by which time their resolution was impractical, if not impossible. Efforts to resolve ADOCS issues continued into the execution phase, but to allow the operational experimentation objectives to be explored a work around involving chat coordination of fires command and control was implemented.

While the reasons for the unavailability of ADOCS developers during the integration periods is understood and the excellent support provided by NWDC contract personnel throughout the integration and exercise periods is greatly appreciated, their limited experience with ADOCS and an understandable lack of access to its code seriously impacted their ability resolve these problems. The availability of an ADOCS developer during the final OSD testing did assist in resolving a number of issues, however their remote assistance during the execution phase was less helpful.

ADOCS Network Performance: As the FTX phase progressed an increase in the latency of updates in the ADOCS network became apparent. When initially reported during execution day Wednesday April 30 it prompted a check of the overall network performance, which failed to reveal any issues.

During the execution day Thursday May 1 the latency became extreme and as was noted during the presence of the Distinguished Visitors at Fern Hill exceeded ten (10) minutes from an action reportedly being taken on the BLR to an update reflecting that action being seen at either of the Coalition ADOCS systems.

A post experiment review of the network architecture deployed for FBE-K suggests that this obviously unacceptable latency was the result of a combination of the topography of the ADOCS server network resulting in a choke point and the underlying protocol for ADOCS communications, which ironically was, designed to service disadvantaged users.

There appeared to be some degree of correlation between increased latency of the ADOCS network, the duration that it had been operating without restart and correspondingly the number of target nominations accumulated in the target list. Consequently the more frequent 'reboots' of the ADOCS servers early in the FTX as a consequence of communications network issues and attempts to resolve continuing ADOCS issues may have masked these effects. That being said the number of targets in the track list never exceeded a couple of hundred, which was reported to be trivial for an operational ADOCS network.

GCCS-M: With rare exceptions, induced by network outages, the GCCS-M system functioned fully effectively. The ability to transfer data between GCCS-M and JSAF as a means of importing and exporting relevant entities between simulated and real worlds was both crucial and highly successful.

GISRC: The operation of GISRC was, with one critical exception, reported to be very successful. There is however a disconnect between the reported operator experience in Fern Hill and the recorded data.

The operator reports indicate that target nominations were routinely sent from GISRC, via secure e-mail, to the ANZAC ADOCS system. With the exception of when this was attempted during the presence of the Distinguished Visitors on execution day May 1, this was reported as successful. Unfortunately, these observations are not supported by the data recorded at various locations, as no 'GA' (GISRC ANZ) targets are recorded. Further, as the data from the ANZAC ADOCS is unavailable for analysis it is not possible to determine the origin of this problem.

Radiant Mercury Guard: To bridge the security boundary between the SECRET US NOFORN and SECRET AUSCANUKUS Releasable networks an approved guard device, a Radiant Mercury Guard (RMG), was employed. Given tight budget constraints and equally tight time lines to accredit the use of this device it was decided during the Initial Planning Conference to 're-use' a previously approved rule set. Without this decision it is highly likely that the coalition initiative would not have proceeded.

Unfortunately, while the existing rule set did include message formats for the essential ADOCS (formerly Land Attack Weapons System – LAWS) messages, they did not reflect the current version of those messages. The understandable inflexibility of the security accreditation process meant that while it would have been technically to update the rules, it was not allowable to do so. As a consequence not all of the data that was being sent to the RMG was passed through to the coalition network.

With respect to its support for transmitting the Common Operating Picture (COP) via the Global Command and Control System – Maritime (GCCS-M), the Radiant Mercury Guard was observed to function fully effectively.

IKA /CIE Systems

A number of Information Knowledge Advantage (IKA) or more accurately Collaborative Information Environment (CIE) tools were employed in FBE-K, including in support of the Coalition Initiative.

Air Gap: While Radiant Mercury Guard was used to filter and transfer structured messages between the SECRET US NOFORN and SECRET AUSCANUKUS Releasable networks the absence of an approved guard device to do so for unstructured, human centric communications necessitated the inclusion of a human-in-the-loop 'air gap'.

Staffed by principally reserves at the Coalition Cell in Newport, releasable information from Chat, E-mail, Voice communications and Web pages was reviewed and where appropriate transferred across the boundary between the networks.

While far from ideal this function was crucial to the success of the Coalition Initiative and served to highlight a critical issue that exists in terms of supporting the integration of coalition partners.

While it is noted that technical solutions, for example ISSE Guard, do exist to support most, but not currently all, of the functions achieved by human-in-the-loop operations, the lead time required to approve the use of such devices, like those for RMG were so long, and costly as to be unworkable in FBE-K.

Chat: Given the difficulties encountered with the technical integration of ADOCS chat provided a crucial backup that enabled both command and control for fires coordination and interactions with the operator of the UAVSim to direct its employment.

Despite their best efforts the reservists were unable to maintain a direct transfer of messages across the air gap. While latency wasn't perceived to be a major issue this 'transcription' of messages was reported to lead to some ambiguity between the XP Cell on the BLR and the ANZAC command team in Fern Hill.

E-mail: A relatively low volume of e-mail was sent to and received from the ANZAC, which resulted in its transfer not being considered too burdensome. However due to the arrangement of air gap operator stations the arrival of any e-mail did result in an increased latency of chat transfers.

The majority of e-mails came from the ANZAC and these contained 'chipped' images from the GISRC that were on-forwarded to an address that automatically populated them into the corresponding target folder. Later in the execution process requests for mensurated coordinates, based on these images were passed to the BLR.

VoIP: VoIP communications were established between the Coalition Cell in Newport and the ANZAC in Fern Hill. The Coalition Cell was also able to communicate with all US nodes that had access to VoIP, although in practice this use was far more limited.

VoIP provided a crucial interactive means of addressing complicated technical issues, particularly those involving the problems associated with ADOCS integration. While there were initial problems with quality of service due to the configuration of some of the network infrastructure, once these were resolved VoIP was consistently of a high standard.

VoIP was observed to work very successfully for technical troubleshooting and also demonstrated its potential to be used for tactical coordination.

Web-pages: Despite assurances to the contrary the majority of the information published on the TT-03 and associated FBE-K web pages were not marked as Releasable AUSCANUKUS, as a consequence during the rehearsal period and into the first days of the FTX only limited information was able to be transferred.

Fortunately a reasonable portion of the information was static; nonetheless as the process of transferring data was relatively complicated it still took a single operator more than twenty minutes to transfer the very limited amount of daily updated information that was relevant and releasable.

As with chat the increasing reliance on web portals to provide access to information necessitates a better solution to the problem of integrating coalition partners.

Networks

CFBlnet: A cryptographically isolated bi-lateral (AUS-US) community of interest (COI) was established within the Four-Eyes (AUS/CAN/UK/US) enclave of the Combined Federated Battle Laboratory network (CFBLnet). With a nominal network capacity of 1.5 MB and even in a non-optimal configuration (IP vs ATM) the network was never reported to have saturated and was typically observed to have operated at approximately 50% capacity.

While problems were experienced with the delivery and maintenance of cryptographic keys, including with the roll over of a new month, these problems did not seriously impact the execution of the coalition initiative.

FBEnet: During the final OSD testing period significant problems were experienced establishing the advanced networking capabilities out to the fleet including the BLR. While these were resolved they did contribute to a loss of valuable time in which to address issues such as those that arose with ADOCS integration, the majority of which only became apparent when BLR ADOCS was brought into the system.

FBEnet stability during the FTX was generally reported as stable and the available bandwidth was apparently adequate to support all the necessary functions. As noted already an investigation

of the network traffic prompted by the observation of increased latency of the ADOCS network did not reveal broader FBE network issues.

Modeling and Simulation

JSAF: The core modeling and simulation for FBE-K was provided by Joint Semi-Automated Forces (JSAF) operated from the NWDC Modeling and Simulation laboratory, Newport. JSAF integrated real world entities 'stripped' from GCCS-M by the C4I gateway and similarly populated / stimulated GCCS-M and other C4I systems.

With one or two exceptions, when it appeared to crash, JSAF operated successfully throughout all phases of FBE-K, from integration testing to FTX FINEX.

UAVSim: The simulation of and distribution of UAV video imagery was a critical component of the Coalition Initiative as it not only provided the necessary realism of input data sources for the ANZAC operators it also provided valuable lessons learned as far as the issue associated with the employment of such capabilities.

As with all systems temporary losses of network connectivity compromised the function of UAVSim and its related components in Fern Hill, however these problems were quickly rectified once the network was re-established.

The ANZAC operators were particularly gratefully for the support, including instruction on operational realities, received from the UAV operator(s) stationed in Newport.

VMS: The Virtual Maritime System is the modeling and simulation capability used to create the vANZAC. While its functionality in FBE-K was relatively limited it was successfully 'federated' with the core JSAF simulation via a convoluted arrangement involving multiple instances of JSAF and the C4I gateway; the RMG and a Federation Object Model / Run Time Infrastructure (FOM/RTI) Bridge.

This federation successfully proved the feasibility of incorporating coalition simulations, from geographically remote sites, into the FBE modeling and simulation architecture. It also served to identify the requirements to reduce the complicated arrangement of systems needed to achieve such federations in the future.

Human Factors

Command and Control Process: The absence of a 'clearly defined', 'tactical level', 'step by step' process for the command and control coordination of fires was, with the possible exception of the technical issues associated with ADOCS integration, the most significant issue encountered by the Coalition Initiative.

The provision of the Fires Manager color chart and the associated articulation of a step-by-step process for fires coordination part way through the FTX were patently to late.

While experimentation with the fires process was expected the majority of the discussion on the topic was focused more on understanding process, and not so much on improving it. Operator confusion at the ANZAC and at the Coalition Cell in Newport was high, leading to lengthy chat and VoIP communications to seek clarification, where as these communications channels should have been being employed primarily for actual coordination.

Operator Training / Involvement: The presence of experienced operators and technical support personnel both in Fern Hill and to a lesser extent in the Coalition Cell in Newport, together with the presence of a Liaison Officer in the XP Cell onboard the BLR contributed significantly to the level of success achieved by the Coalition Initiative.

While an appropriate degree of system level training was provided to ANZAC operators the technical difficulties addressed above compromised the ability to do unit level and above training.

The absence of 'a priori' standard operating procedures (SOPs) for the fires coordination process, together with the continued presence and efforts to resolve ADOCS integration issues essentially undermined all higher level training. The result was the on-going confusion experienced by the Coalition team in the fires coordination process.

5.2 TST PROCESSES INITIATIVE RESULTS

5.2.1 Pending Tasks

The TST C2 System needs to explicitly tell operators which tasks are theirs to perform and their priority. The ADOCS approach of one big table for MISSION FIRES COORDINATION and one big table for the JOINT TIME SENSITIVE TARGETS MISSIONS is not well engineered for people performing required tasks.

- JFMCC, the JFACC, the JFACC TST cell, X-Ray Papa, and others need to distinguish which targets on the list are their responsibility and which are someone else's.
    - This requires them to scan the list doing mental vertical sorting.
- They also need to see if there is some action for them to take.
    - This requires them to scan the table doing mental horizontal sorting.
- They have no list of pending actions.
- There is no prioritization of actions waiting to be performed.

Tracks or tasks are implicitly queued up waiting for action, but the ADOCS system has no explicit queues of pending actions. If one thinks of tasks (tracks) as waiting for service by someone, then there is no engineered discipline about who gets served next. It isn't even fair to say that the next target to be served is random (in the Monte Carlo sense). It appears that it will vary from operator to operator depending on how an operator's eyes scan the table. It is more haphazard than how different people scan their e-mails (most people routinely approximate LIFO or FIFO disciplines).

The order in the ADOCS table has to do with when the original nomination came in. There is no organization based on actions waiting to be performed. The implication of this observation, is that there should probably be explicit lists (queues) of waiting actions, and a requirement for explicit tools or windows for people to cycle through those pending actions in some default or operator-adjusted prioritized order.

5.2.2 Human Systems Integration for Color-coding

For time-critical tasks, the TST C2 System color-coding should be standardized and intuitive so that operators will respond predictably and quickly.
Color-coding is critical to using ADOCS as a coordination tool. Operator discussion which color means what quickly degenerated to

- "You can use this color to mean this if it's in this block entered by this person, but it could mean that in that block if entered by that person." or
- "This other color could be used here, and that color could be used there."

The discussion usually reaches a climax when someone says that a color can

- "mean whatever you want."

Then they finally sit down and invent a color scheme, which is non-standard because there are no standards.

This isn't merely a training or doctrine issue. If color-coding is being used for coordination of time-critical tasks, then the colors or symbols used should be engineered to be much more intuitive than they are. Ideally,

- as intuitive as real traffic lights so that people will respond predictably, and quickly.

5.2.3 Human Systems Integration for Symbol-coding

For time-critical tasks, the TST C2 System use of symbol-coding to supplement color-coding should be automated, streamlined, or eliminated. The coding scheme developed for ADOCS blocks includes an X in some blocks on top of the color. This scheme now requires two distinctly different sets of actions, one to set the color, and another sequence of actions to add the X when needed. This is not as streamlined and error-resistant as a TCT process should be.

5.2.4 Equipment Casualty Modes

The TST C2 System needs to have reliable alternative modes of operation and more graceful degradation than is currently available with open-architecture LANs and internet-style networks. When the Secret LAN wasn't available and there was no ADOCS, no chat, no SIPRNET e-mail, etc., one of the reactions was to discuss and explore "what are our work-arounds."

- A bigger question for Network-centric Warfare and FORCEnet is whether or not casualty modes will be engineered into the architectures.

Most legacy combat systems have casualty modes. Some have several levels of casualty modes. There is a risk that the down-time and network problems encountered in FBE-K may not be atypical of what might occur in the real world with leading edge technologies, pushing the envelope, built on open-architecture machines and networks.

5.2.5 Target Prioritization

The TST C2 System needs a TST prioritization scheme that takes into account both the importance of the target and the amount of time that it will be available for engagement. There is a non-mandatory block in ADOCS for target priority. Some units made their own inputs there. Most didn't.

- Procedures are needed for who is supposed to enter a priority.

Most important are:

- What does the priority mean?
- How is it to be determined?

There are static priority categories listed in the CJTF TST matrix, but those numbers don't take into account

- the amount of time available to engage the target.

There are available simple mathematical models (formulas) for prioritization based on both target utility and probability that it will remain engageable for some period of time (one simple approach looks like economic discounting). Target prioritization needs to be addressed in TST command and control.

5.2.6 TSTs that move, re-position, and change status

The TST C2 System needs functionality for automatically and unambiguously keeping track of targets that move, re-position, and change status. ADOCS needs functionality added for targets that may move (allowing a track number to move with them so long as they are held by sensors), i.e., dynamic target position information rather than static data fields. Concurrently functionality is needed for automatic updating and alerting of decision makers and engagers. This shouldn't rely on voice or chat or typed-in remarks.

ADOCS functionality is also needed for other critical changes in target status, such as missiles transitioning from stowed to erected positions. This may require dynamic updating of target description, and certainly needs automatic updating and alerting of decision makers and engagers.

5.2.7 Alternative Approaches to Time Sensitive Command and Control

Systems engineering of a TST C2 System should look beyond the extensive typing input-output approach in ADOCS, and its matrix displays, for TST coordination status. It became apparent

during FBE-K that many of the C2 processes in ADOCS are

- complicated,
- difficult to define unambiguously,
- challenging to train to, and
- highly dependent on internet chat and voice elaboration.

It is understood that the "development" of ADOCS is an Advanced Concept Technology Demonstration (ACTD). Presumably, the ACTD was focused on whether or not this concept and technology can be applied for Army artillery deep operations. A question now that the technology is being demonstrated is:

- Is it is the right concept to be applied to Joint Time Sensitive Targeting?

Because of the time-sensitivity of the targets and because it is at the tactical level of war, some of the functionality built into air defense command and control systems, such as NTDS or AEGIS or AWACS should be examined for applicability to ground TSTs.

Besides being used for air targets, NTDS and AEGIS, C2 systems are applied very effectively for anti-submarine command and control, and for maritime anti-surface command and control. These systems, and their inherent interoperability with AWACS, Link 16, (and maybe CEC), etc., should be examined closely for functionalities applicable to ground TST C2.

No matter what advances are made in internet technology (and FORCEnet), it is unimaginable that anyone would ever seriously suggest replacing existing Air Defense C2 systems with internet chat and convoluted status board collaboration as currently used in ADOCS.

- This suggests that the advantages of real-time tactical data systems should considered for other tactical time-sensitive command and control such as for ground TSTs.

5.3 OBJECTIVE DATA

5.3.1 Data Overview

Compared to other recent FBEs the objective data provided for this experiment was deficient in quantity and quality. In particular:

- The provided TES-N covered only a few days of the CPX and was reformatted so as to be unusable.
- No GISRC data were provided.
- The ADOCS JTST manager did not set capture mission histories for the last two days of the experiment
- After acquiring excellent mensuration data from RRF in FBE-J, FBE-K reverted to PTW which has never provided usable data.
- The JSAF event data logged in SNN did not include Fire events. There were gaps in the JSAF event data and/or many fire commands did not reach JSAF.

Among the factors contributing to this degraded data state:

- The teams supporting some of the systems, notably ADOCS and GISRC, were new to FBEs.
- More systems were organic to operational platforms.
- Integration testing ran behind schedule.

5.3.2 ADOCS Fires and JTST Displays

The ADOCS data logs were collected daily and provide the end-state of the experiment day's Mission Coordination: Fires (hereafter Fires) and JTST Manager displays. Table 1 below provides the number of nominations as a function of the nominator for the last several days of the FTX. The experiment day ran from approximately 800 to 1800 Guam time. The times reported in ADOCS were GMT. The missions in ADOCS were assigned to Guam experiment day X if the time the mission was received in ADOCS was between GMT day X-1 1400 hours and GMT day X 1400 hours. Most missions were received during the nominal experimental day but some nominations, particularly for DD-X, were received outside these hours. The data in Table 1 were derived from the ADOCS logs from the Newport ADOCS server. The Newport server data were not captured on April 29. Only the period subsequent to April 27 is addressed.

Table 1. ADOCS Target Nominations from the Newport ADOCS Server

Date	Target Nominations								TOT
	AA	AB	AE	AX	GE	GX	TB	XX	
5/2	9	9	0	27	5	18	3	0	71
5/1	3	31	0	1	5	23	9	4	76
4/30	11	15	0	22	5	20	4	2	79
4/29	NA	NA	NA	NA	NA	NA	NA	NA	NA
4/28	10	10	0	0	5	0	3	11	39
TOT	33	65	0	50	20	61	19	17	265

Notes to Table 1:

The nominator codes appearing in Table 1 are as follows:

AA ANZAC ADOCS
AB Blue Ridge ADOCS
AE E-2C ADOCS
AX DD-X ADOCS
GE E-2C GISRC
GX DD-X GISRC
TB Blue Ridge TES-N
XX Test

Codes are used as prefixes for the target numbers nominated by the corresponding nodes.

Not all test cases were distinguished by the XX prefix. There were a few cases where nominations are identified as tests in the target description but are given the normal nominator prefix. These cases are not separated out in the above table.

Table 2 presents the same data as seen in data logs from the Blue Ridge ADOCS server.

- The expectation is that Tables 1 and 2 would show the same results. They do not.

Table 3 shows the nomination differences between the Blue Ridge and Newport ADOCS server logs for each experiment day as a function of nominator. In a few cases, one of the logs will inexplicably contain a mission from a previous day. In principle, the discrepancies could also be caused if one of the ADOCS servers was shut down prior to the end of the experiment day. But a review of the data for May 1 and 2 show no evidence of this. Each cell in Table 3 contains the total discrepancy between the two Newport and Blue Ridge ADOCS listing the total number of nominations that appear in one ADOCS but not the other, rather than the simple difference in the counts in the two displays.

The impact of the failure of all target nominations to appear in all ADOCS workstations is illustrated by nomination TB0051 which occurred on April 30. This mission appears in both the Blue Ridge and ADOCS servers it did not appear in the E-2C ADOCS workstation which was being tasked by the TST_LNO to engage the target. Communications and actions relating to this nomination are found in Annex B2.

Table 2. ADOCS Target Nominations from the Blue Ridge ADOCS Server

	Target Nominations								TOT
Date	AA	AB	AE	AX	GE	GX	TB	XX	
5/2	8	14	0	27	5	17	2	0	73
5/1	5	37	0	1	5	24	8	3	83
4/30	10	15	0	12	6	12	4	2	61
4/29	2	17	1	6	5	6	9	0	46
4/28	4	10	0	0	5	0	3	20	42
TOT	29	93	1	46	26	59	26	25	305

Table 3. The difference in nominations appearing in the Blue Ridge and Newport ADOCS

Date	Target Nominators					
	AA	AB	AX	GE	GX	TB
5/2	1	8	0	0	1	1
5/1	3	8	0	0	1	2
4/30	1	0	10	1	8	0
4/29	NA	NA	NA	NA	NA	NA
4/28	6	2	0	0	NA	0

The ADOCS Fires Manager is the tool for engagement prosecution. The ADOCS Joint Time Sensitive Target (JTST) Manager is the tool for cross Component TST coordination. Only the Blue Ridge ADOCS server displayed and logged the JTST Manager data (All the Component

inputs were simulated in various cells on the Blue Ridge).

Table 4 compares the data from the Fires and JTST Managers. The number of target nomination appearing in the JTST Manager is many fewer than appears in the Fires Manager This is not unexpected since non-TST targets should not be promoted to the JSTS. Other differences are of more concern. In particular, some targets appear in JTST but not in Fires (e.g. TB 0060 on 1 May and TB 0063 on May 2). Another problem is that the status of engaged targets that appear in both tables is not the same (e.g., on May 1 Both TB0062 and TB0058 are shown as engaged in Fires but only TB0058 is shown as engaged in JTST).

Table 4. Comparison of Mission Coordination: Fires and JTST nominations from the Blue Ridge ADOCS server data

		AA		AB		AE		AX		GE		GX		TB	
		N	F	N	F	N	F	N	F	N	F	N	F	N	F
5/2	Fires	8	3	14	1	0	0	27	21	5	0	17	8	2	1
	JTST	4	1/1	1	0/1	0	0	0	0	2	0	3	1/1	3	0/3
5/1	Fires	5	0	37	16	0	0	1	0	5	**0**	24	12	8	**1**
	JTST	2	0/1	1	0/1	0	0	0	0	1	**1**	9	0/2	6	**2**
4/30	Fires	10	4	15	9	0	0	12	12	6	4	12	10	4	0
	JTST	4	2/2	0	0	0	0	0	0	4	2/1	2	1/1	4	0/3
4/29	Fires	2	0	17	6	1	0	6	0	5	1	6	2	11	**1**
	JTST	1	0	1	0	1	0	0	0	3	1	0	0	4	**2**
4/28	Fires	4	0	10	**0**	0	0	0	0	5	0	0	0	3	0
	JTST	1	0	8	**1**	0	0	0	0	1	0	0	0	1	0

Notes to Table 4:

(1)Column N gives the number of target nominations
(2)Column F gives the number of missions where the target was engaged.
(3)Fires engagement is defined as having the FRD block green
(4)JTST engagement is defined as having the MSN block green. EXE is almost always also displayed in the block.
(5)The data in the F column for JTST is presented in the form 2/1. The first number indicates the number of MSN blocks that are green and contain the characters EXE. The second number indicates the number of MSN blocks that contain EXE but are yellow.
(6)The interpretation of the second number is unclear. Where only a single number appears all the fired missions were Green with EXE.
(7)Some inconsistencies between the number of missions fired in Fires and JTST are indicated by bold typeface.

It is concluded there are significant inconsistencies in the ADOCS Fires displays in different servers and significant inconsistencies between the Fires and JTST Manager displays. As a result of these inconsistencies ADOCS fails to provide an unambiguous common operational picture.

5.3.3 Target Handoffs.

From the last four days of the FTX the table below presents, for each nominator, the number of nominations that were paired to a firer, as indicated in the Blue Ridge ADOCS, and which firer they were paired with. The last column provides the percent of the cases where the paired shooter was the same as the nominator. Where the nominator had an engagement capability, the mission nominator was also the shooter in 71 to 100 percent of the cases; relatively few nominations were passed to another shooter for execution. There was limited collaboration among the engagement platforms. The DD-X in particular (nomination prefixes AX and GX), engaged virtually all the targets it nominated. The nominations originating on the Blue Ridge (nomination prefixes AB and TB) had to be passed to other platforms for engagement since the Blue Ridge had no engagement capability. The GISRC on the vANZAC performed no target nominations or at least none that reached the FBE net ADOCS.

Table 5. 4/29 to 5/2 BLR ADOCS Data. Number of nominations that were Weapon-Target paired and the number that were paired with the nominator as a function of nominator.

Nominator	# Noms	# Noms paired	% paired	Paired platforms			% paired with nominator
				DAH	ANZ	E2	
AA	25	14	56	2	10	2	71
AB	79	52	66	30	18	4	0
AX	46	43	93	43	0	0	100
AE	1	0	0	0	0	0	NA
GE	20	11	55	2	0	9	82
GX	60	45	75	43	1	1	96
TB	26	11	42	6	1	4	0

5.3.4 Mensuration.

In FBE-K, the messages used to request target mensuration and to report the georefinement results used in other FBEs were not employed. The pre experiment mensuration procedure was a chat request for mensuration to PTW and for the PTW operator to enter the georefinement result directly into the Electronic Target Folder (ETF). There was a IRC comment by the PTW operator that he was not connected to the web, hence he could not insert the results into the ETF. In practice, mensuration was seldom performed as result attributable, in part, to the poor quality of some of the imagery and in the difficulties in transmitting imagery to PTW. It is the case that there is not a single instance, for the interval 28 April to 2 May, where the Georefinement block in the ADOCS Fires Manager indicates that georefinement data was provided for a target.

The TST_GEO_REF IRC channel was unused for the duration of the experiment

Georefinement was not a consideration in the engagement process in this experiment.

5.3.5 Rapid Planning Mode (RPM)

RPM is a system used to, on request, compute the routes for TLAM missions. The data collected from this system have been used to compute the intervals between receipt of the mission request and the start of the route computation , the interval required for then actual route computation, and the interval between the completion of the route computation and the transmission of the route result. These intervals are shown in Table 6 where are compared with the results from FBE-I. The data for FBE-K include only the interval April 28 to May 2. In both cases only GO results are included. The much longer interval in which the route are waiting attention and the much faster computing time in FBE-K are notable. The following explanation of these differences was provided by Dan Turpin of Boeing.

In FBE-K the new PC-based RPM was used. The FBE-I system was a UNIX-based implementation. On that system, the SMTP (E-mail) server delivered E-mail to the waiting client immediately upon receipt. On the PC implementation, used for FBE-K, there is a polling interval which has a minimum setting of one minute. In the PC implementation, Microsoft products are relied on to handle the E-mail interface, while on the UNIX side Boeing implemented their own interface to the HP-UX SMTP server. The timing information reported when a request was received on UNIX is truly the time the local SMTP server received the message and notified the waiting RPM client. On the PC side, it looks like the time is generated by the Exchange server, external to the local Outlook Express client on the RPM machine. It appears that the receipt time on the PC version is probably set earlier than when the message is actually received by the RPM software. The timing information for message receipt to the start of processing is really difficult to compare between the two implementations. For the route computation time, that's a function of processor speed. The old HP UNIX systems were running around 100 MHz while the PC systems were somewhere in the 1.2GHz range.

Table 6. A comparison of RPM Processing times from FBE-K and FBE-I
(Times are medians and in seconds)

Experiment	Intervals				Sample size
	Request receipt to start computation	route computation	Complete computation to send result	Total: receipt to send	
FBE-K	251	17	5	277	116
FBE-I	4	71	2	79	75

5.4 ENGAGMENT TIMELINES

5.4.1 TST TTP

The significance of the colors in the ADOCS coordination blocks and the agent that controls the status of the blocks is routinely a problematic issue in FBEs. FBE-K was no exception. Table 7 presents the instructions distributed to participants for the ADOCS Mission Coordination: Fires Manager. Following that, in Table 8, is an excerpt taken from the ANZAC_OPS IRC channel on April 30. In this, XP_ANZAC defines the methodology to be used for color changes in the ADOCS Mission Coordination: Fires XPA and ANZ coordination blocks. The two procedures described in Tables 7 and 8 are not the same. For example, Table 7 indicates the ANZ going yellow shows the ANZAC is ready to engage. Table 8 states the ANZ going yellow indicates the assignment of the target to ANZAC by XP. This no doubt contributed to participant confusion regarding ADOCS TTP procedures. That confusion is well illustrated by an excerpt from the AIR_OPS IRC channel of a conversation that occurred on April 30 (see Appendix A).

In the examination of individual engagement timelines where there is a conflict between the procedures defined in Tables 7 and 8, the latter is taken as the standard.

Table 7. FBE-K ADOCS Mission Coordination Fires Approval Block Color Codes

Mission Coordination: Fires - Active Missions					
Tab	**Tab Definition**	**Responsible Party**	**Color**		**Definition**
TCT	Time Sensitive Target determination	XP		Yellow	Possible TST, Begin Strike Planning
				Red	Not a TST
				Green	Confirmed TST/PID
XPA	Experimental Strike Warfare Commander	XP		Yellow	Strike approval received
				Blue	Acknowledged
				Green	Cleared to engage (w/ green range)
				Red	Abort
E2X	Virtual vE2X Mission Assignment Coordination	E2X		Blue	Acknowledged
				Yellow	Ready to engage
				Green	Shooter cleared to fire
				Red	Unable to execute
				White	No Mission assigned
DDX	Virtual vDDX Mission Assignment Coordination	DDX		Blue	Acknowledged
				Yellow	Ready to engage
				Green	Shooter cleared to fire
				Red	Unable to execute
				White	No Mission assigned
ANZAC	Virtual ANZAC Mission Assignment Coordination	ANZAC		Blue	Acknowledged
				Yellow	Ready to engage
				Green	Shooter cleared to fire
				Red	Unable to execute
				White	No Mission assigned
ADC	Air Defense Commander	XP/TCT		Red	Pending De-confliction
				Green	De-confliction Complete
JIC	Joint Intelligence Center	JIC		Yellow	
				Green	
				Red	
				White	

Table 8. ADOCS Missions Coordination: Fires TST TTP (Chat Excerpt)

[00:07] <XP_ANZAC> 1. XP acknowledged and working mission - XP turns XPA tab yellow.
[00:07] <XP_ANZAC> 2. XP assigns mission to vANZAC - XP turns ANZ tab yellow
[00:07] <XP_ANZAC> 3. VANZAC acknowledges mission - XP ANZAC turns ANZ tab blue once acknowledgement received via chat from CO ANZAC.
[00:07] <XP_ANZAC> 4. VANZAC accepts mission - XP ANZAC turns ANZ tab green once mission is accepted via chat from CO ANZAC.
[00:07] <XP_ANZAC> 5. XP acknowledges mission acceptance - XP ANZAC turns XPA tab blue.
[00:07] <XP_ANZAC> 6. XP authorizes engagement - XP turns XPA tab green
[00:07] <XP_ANZAC> 7. CO ANZAC engages.
[00:09] <XP_ANZAC> This is current procedure for us.
[00:09] <CO_ANZAC> rgr-copy. We will pass to AUS

The headings of the coordination blocks in the post trial reconstructed ADOCS Fires displays are the same as those used in FBE-J and are not those used in FBE-K. The correspondence between the headings is shown in columns 1 and 2 of Table 9. In the Mission History files, a completely different set of names are used when referring to coordination block actions. The correspondence between those names and those used in the ADOCS Fires display is given in the third column of Table 9.

Table 9. Correspondence between the Multiple names applied to the ADOCS Mission Coordination: Fires Coordination Blocks

Post Trial Display	FBE-K	Mission History
MCC	TCT	TGT
STW	XPA	OPS
SCC	E2X	AIR
MIW	DDX	OPT1
IWC	ANZ	OPT2
ADC	ADC	OPT3
AWC	JIC	OPT4

5.4.2 TTP Issues

Appendix A contains event timelines for several target nominations. Detailed examination of the engagement timeline events provides objective information on the TST TTP actually used and an assessment of the systems employed in prosecuting the targets. All the timelines include operator actions extracted from the ADOCS Mission History logs and participant conversations excerpted from multiple IRC channels. Where pertinent, data are also taken from RPM and SNN which

respectively contain TLAM route generation events and JSAF engagement information. General conclusions from a review of these timelines are presented below.

ADOCS Coordination Block Actions

The actions of the ADOCS workstation operators in changing the colors of the coordination blocks illustrate many departures from the published TTPs. A primary cause for this was the participant confusion regarding the TST TTP. Such confusion has been a chronic ADOCS problem in FBEs. Another factor contributing to these departures is latencies and inconsistencies in the ADOCS displays (see Section 5.2.2)

The types of departures, in ADOCS, from the TTP include:

a. Required TTP actions not taken.

b. Actions taken but not by the responsible node.

c. Actions taken that are undefined by the TTP and hence meaningless.

d. Actions executed in the wrong sequence.

e. Actions executed in such a way as to indicate that the actions were taken to force the engagement to a conclusion rather than as a result of a realistic response to the simulated engagement.

Table 10 shows, for the five timelines examined from late in the FTX, the correspondence between required coordination block actions (as defined by Tables 7and 8) and what actually occurred.

Table 10. Mission Conformance to TTP

Actio	Target Nomination				
	TB0050	TB0051	AB5027	GX0321	AA0368
TCT yellow (begin strike planning)	N	Y	N	N	Y
TCT green/red (yes/no TST)	N	Y	N	Y (4)	Y
Promote to JTST	Y	Y	N	Y	Y
ADC red (deconflicting)	Y	N	N	Y	Y
ADC green (deconfliction complete)	Y	Y	N	N	Y
XPA yellow (working mission)	Y	Y	Y (1)	Y	Y
Shooter yellow (assigned mission)	Y	Y	Y (1)	Y	N
Shooter blue (ack assignment)	Y	N	Y (2)	Y(3)	N
Shooter green (accept mission)	Y	N	Y (3)	Y(3)	Y
XPA blue (ack acceptance)	Y	N	Y	Y	N
XPA green (authorize engagement)	Y	N	Y	Y	Y
FRD green (weapon fired)	Y	N	Y	Y	Y

Notes to Table 10:

(1). These events appear in the wrong sequence.

(2). This is IRC statement from ANZAC that they turned the ANZ block blue in their display. This does not appear in the FBE net ADOCS.

(3) This action was taken by BLR on behalf of ANZAC.

(4) Action out of sequence. The target was not confirmed as TST until after the engagement was completed.

ANZAC ADOCS Coordination Block Actions

In the BLR ADOCS Mission History no actions were reported as executed by ANZAC. All those actions which should have been executed by ANZAC were carried out on the BLR The IRC chat shows that the ANZAC was executing the required actions (e.g., see mission AB5027 Annex B3) but it appears that these events were not making it through Radiant Mercury to the FBE net. The ADOCS TTP promulgated on May 1 (see Table 8) has the BLR entering into ADOCS the required ANZAC actions on receiving the IRC communications requesting those actions from the ANZAC. It is presumed this TTP was created to circumvent Radiant Mercury.

Redundancy of IRC and ADOCS

The event timeline IRC entries sometimes show detailed reporting regarding the color block changes that are being made to the ADOCS display (e.g., see AB 5027). This is attributable, in part, to uncertainty among some participants about the TST procedures and, in part, to the lack of confidence in ADOCS to accurately reflect, in a timely manner, the operator block actions to all ADOCS workstations. These detailed communications result in an expansion of the engagement timeline and, in effect, make ADOCS redundant – all the coordination actions appear to be occurring in chat and ADOCS becomes unnecessary.

5.4.3 ADOCS issues

Latencies and Inconsistencies

Latencies and/or inconsistencies in the ADOCS information are common. Such ADOCS latencies/inconsistencies have been a recurrent problem in FBEs. Specific problems revealed in the development of engagement timelines include:

a. Missions appear in some ADOCS workstations but not others.

b. The coordination block status can be different at different ADOCS workstations.

c. The mission status (e.g. fired or not fired) may be different in the Mission Coordination: Fires and JTST Managers. For the JFMCC/XP ADOCS Mission Coordination: Fires Manager is the primary tool for prosecution of TSTs. The JTST Manager is a collaboration tool to provide TST situational awareness to all Components.

d. The Mission Coordination: Fires and JTST Mission Histories can be inconsistent.

e. Mission status as determined from the Mission History may not agree with the status in the Mission Coordination: Fires display

f. Some events are missing from the Mission Histories.

g. There are multiple examples in the Mission History of blocks being changed from colors that they do not hold. For example mission GX0231, at 3:15 XPA changed from white to blue (by BLR SPARE 4 ADOCS workstation). The next recorded action for that block shows it being changed at 3:18 from white to yellow (by the BLR JOC STATION 3). There are two possible explanations for this: there is an event changing the block from blue to white missing from the Mission History log or the change at 3:15 was not received by the second workstation so in his context the block was still white .

Specific examples and details of these problems are highlighted in the examination of mission timelines in Appendix A.

ADOCS is the core tool for TST engagement and target management. If this tool does not provide timely reliable and consistent information the engagement process, at the least, will be degraded in terms of timely and accurate delivery of ordinance to the target, at worst the engagement will not be executed at all. These inconsistencies also make it difficult to reconstruct and evaluate what actually occurred.

Radiant Mercury
ANZAC reported Fires mission manager for ANZ tab resets to white for every Radiant Mercury Guard (RMG) transmission. The work around was for BLR ADOCS operator to edit ADOCS tabs on behalf of ANZAC.

5.4.4 Other issues

System Clock Synchronization
System clocks were not synchronized. The time stamps applied to the ADOCS Blue Ridge logs are about 4 minutes different from the time stamps applied to IRC logs.

Target Position Georefinement
There is no indication for any of the reviewed engagements that target georefinement was performed.

IRC Nets
Because the FBE net and Coalition net are not connected, IRC communications must be manually transferred from one net to the other. Typically there was about a seven minute interval between the appearance of a message in the two IRC nets.

5.5 ISR AND JFN OBSERVATIONS

These results are extracted from Appendix D. For a complete description of ISR and JFN observations from the viewpoint of operations within the JIC, see that appendix. Those deemed to have had the most significant impact on achieving the Fires Initiatives objectives are discussed here. The observations are in categories and presented as paired observation-recommendation.

5.5.1 FBE Planning, Organization, and Execution

Continuity Between Concept Development and Experiment Implementation

Observation: A lack of continuity existed between the development of FBE-K concepts/initiatives involving ISR/JFN, and the actual FBE-K planning/implementation. Among other things, this discontinuity hampered the development of meaningful analytic questions, and the experimental techniques to help answer those questions.

Recommendation: Those involved in the development of experimental concepts and initiatives must remain fully engaged throughout the FBE planning process, if not also during the execution and after-action analysis, to ensure the FBE is properly focused on addressing the original intent of those concepts and initiatives.

Staff Participation; Fleet Training vs. Experimentation

Observation: From the ISR perspective, FBE-K degenerated almost completely into a JFN systems training event, largely because participation by C7F Staff and Fleet forces in the planning, preparation, and execution was constrained to such an extent as to preclude meaningful ISR and JFN-related experimentation.

Recommendation: Ensure ISR and JFN related experimentation involving a Numbered Fleet has full buy-in and participation of that Numbered Fleet staff, particularly the operations (N3) staff. Be prepared to postpone or cancel experimentation events that are dependent on Numbered Fleet staff participation as soon as it becomes obvious that the bulk of that staff's focus will and should be elsewhere other than on experimentation. And focus experiments on experimentation, and not on Fleet training / exercises.

NWDC Division of Labor and FBE "Supporting Services"

Observation: FBE-K experienced some of the same difficulties with intra-NWDC organizational challenges and "division of labor" issues as past FBEs. While these were decidedly not "showstoppers" in FBE-K, future FBE planning and execution could be significantly enhanced by their rectification.

Recommendation: Provide greater clarity on intra-NWDC "division of labor" for all the various aspects of FBE planning and execution. Explicitly identify "supporting services" (such as information/knowledge management and COP/database maintenance) that are above the strictly technical level, but are distinct from any "supported" functional/experimental initiatives. Assign appropriate roles, responsibilities, and resources to address each of these services.

Document Control

Observation: Like most previous FBEs, FBE-K suffered from a lack of document control for most of the key coordinating documents.

Recommendation: Early in the FBE planning stages, identify key coordinating documents (and their owners), and implement an FBE-wide common methodology for the cooperative production, review, maintenance and accessibility of those documents -- while at the same time keeping this "FBE document control" methodology / system as accessible, flexible, and non-burdensome as possible.

Live Forces, ISR Assets, OPFOR, Emitters, and Fires

Observation: As advanced as today's M&S is, it is no substitute for the incorporation of live forces and live operations into Fleet Battle Experiments.

Recommendation: Conduct all future ISR, targeting, and JFN-related experimentation with as many live forces (including live OPFOR) as possible to increase the fidelity of the experiment to a level that includes as many of the "truly hard" analytic processes as possible.

5.5.2 Technology and Systems

Operational Sequence Diagrams

Observation: Functional Flow Diagrams (FFDs) should be developed prior to (or in conjunction with) Operational Sequence Diagrams (OSDs).

Recommendation: For subsequent FBEs (and other experimentation events), FFDs should be institutionalized as required documents for all initiatives, to describe who at which functional nodes need (or will provide) what information from (to) whom and why. The OSDs should subsequently (or concurrently) be developed as the technical reflection of those FFDs.

Common Operational Picture (COP)

Observation: The COP in FBE-K did not have explicit "ownership" by any initiative, and was not maintained to a level required to support ISR and JFN in support of TST.

Recommendation: Early in the FBE planning stages, identify who has responsibility for each of the many complex, interdependent functions that go into producing an accurate, stable COP from which players will be capable of "fighting the experiment" (instead of fighting with the COP). Consider doing the same with other "foundational" FBE processes, depending on the nature of the experiment.

Tactical Exploitation System – Navy

Observation: FBE-K reconfirmed that TES-N has a number of powerful tools (some of which are unique to TES-N) that potentially could be of great use to Naval forces involved in Time Sensitive Targeting (TST). Unfortunately, FBE-K also reconfirmed that TES-N remains a very complex and developmentally immature system, with extremely limited interfaces to other C4I systems that are critical to TST, in particular GCCS-M and ADOCS.

Recommendation: Don't use TES-N in any further TST-related experimentation until major advances are made to at least the following: (1) interface with ADOCS; (2) interface with GCCS-M; (3) interface to PTW and any external target folder applications (e.g., attachment of image chips to ATI.ATR messages); (4) handling of ISR video and platform/sensor telemetry;

and, (5) SCI COMINT analysis tools, and SCI-to-GENSER connectivity via ISSE Guard.

5.6 TECHNICAL RESULTS

These results are extracted from Appendix C. They provide a more complete description of technology issues than presented in the former section. For a complete description of technical impacts on the experiment, see Appendix C. Those deemed to have had the most significant impact on achieving the Fires Initiatives objectives are discussed here.

5.6.1 Summary

- In-depth insight was gained into many JFN systems issues, myths and realities. It was learned once again that TES-N is a complex and developmentally immature system whose strength/weakness are directly related to the strengths/weaknesses of its interfaces with communications, with other JFN systems, and with ADOCS.
    - Getting TES-N, the rest of the JFN equipment, and its many intricate interfaces to really full mission capability requires the regular (daily?) attention of a wide range of cooperating technicians and system operators, both on board and off board.
    - Operational testing, using scripted scenarios (if not live downlink events) forces issues to surface that would not appear in system demonstrations or static testing.

- Remote M&S stimulation of TES-N / JFN was sufficient for familiarizing C7F Staff with the basic processes involved in using TES-N / JFN in support of TST but not for true training or experimentation.
    - Continue to improve quality of M&S video and imagery (e.g., 1-meter base), and platform / sensor / feed characteristics (particularly simulation of U-2 products).

- TST Target Folder server concept as a common repository for relevant TST target data was successfully demonstrated.
    - Continue attempts to incorporate program-of-record digital target folder solution (e.g., Joint Targeting Toolbox, based on MIDB) into future ISR / TST experimentation events.

- Several planning issues impacted the quality of the experiment. Recommendations for improvement are:
    - Thoroughly test TES-N to ADOCS target nomination interface prior to event STARTEX, including a close examination of how individual data fields are handled through the whole process.
    - Clarify division of labor (and increase frequency of joint planning sessions) between functional leads, IKA team, and the technical team
    - Assign COP ownership and explicitly state roles and responsibilities (of above three, plus players)

- Produce "Functional Flow Diagrams" (FFDs?) before technical-level OSDs.
- Provide FBE-wide document responsibilities, control, and distribution.

5.6.2 M&S Feeds Into TES-N

Video: During both CPX and FTX, simulated ISR video was produced by AFSERS-MUSE, fed into the NWDC video controller in Newport, distributed as MPEG-4 to BLR via the FBE WAN (including KuBand SATCOM). The MPEG-4 stream was converted and fed by the NWDC video remote server on BLR as analog video (RS-170) into TES-N's video switch, which then presumably re-digitized the video for distribution to any GENSER-level TES-N Multi-Function Workstation

- The video feed into TES-N was stable and reliable aside from BLR video remote server's display need for re-set.
- Simulated ISR Video C2 allowed rapid response to changes in circumstances and/or FBE participant requirements.
- Some confusion over who had C2 over which simulated ISR video asset demonstrated the need for a well-established C2 structure for ISR operations.
- Coordinate with ISR "pilots" via voice-only proved unwieldy due to lack of a workstation IP Chat capability.
- After an A-to-D conversion or two, the video displayed on the TES-N MFWS was barely useable for TST detection and identification.
- Video image "chips" captured by TES-N were of significantly lower quality than those captured from the same source by the GISRC workstations at Newport and Dahlgren.
- The quality of the simulated video would not be sufficient for any type of targeting experimentation beyond just going through the process motions.
    - When zoomed in close enough to support positive identification (PID) of the TST, the background of base imagery became so blurred as to appear solid, thereby losing all visual context.
    - The combination of low resolution and the lack of features that are easily identified at coarse image resolution prevented visual-point-transfer between the video images and the Digital Point Positioning Database (DPPDB).
    - The 3D models of the TST objects are too easy to pick out (initial detection), as they "lay on top" of the terrain instead of being part of it, thereby providing a false sense of the level of difficulty of initial TST detection with a video sensor.
- TES-N could not do any parsing or processing of the telemetry data provided by the ISR video platform M&S system other than display it, on-screen, "burned in" as part of the video images themselves.

Imagery via JCA Imagery from simulated national and other sources was produced in NITF format by the AutoSIGS system at M&S Central in Newport, and then transferred (FTP) to JCA's Command IPL located at ONI in Suitland, MD. JCA connectivity (via Challenge Athena III SHF SATCOM) allowed users aboard BLR to access the JCA IPL (via the web-based Quick Query or Q2 application), and pull the images down to the BLR IPL. From there they could be accessed by either PTW or TES-N, the latter of which could pull the images over to its own system server, and process the NITF headers to register the images in its DBO (Database Organizer) application.

- There were two major hurdles to successful use of this method of image file transfer:
    - Getting permissions to access the "real world" JCA IPL is a long and difficult process.
    - Modifying AutoSIGS software to allow production of NITF headers with a country code of something other than the default CC.
- Simulated AutoSIGS image quality
    - was sufficient for analysts to run through proper procedures,
    - was insufficient for any experimentation involving actual imagery analysis, targeting, or battle damage assessment.

U-2 Dragon Lady simulation (from AFSERS-TENCAP aboard BLR) Attempts were made to simulate the inputs into TES-N that would come from a U-2 Dragon Lady aircraft as if it were downlinking directly to BLR. These inputs fall into two categories:

- Images: AFSERS-TENCAP on BLR would FTP two images per collection "event" in NITF format to TES-N: a low-resolution image to the TES-N Screener application, and a high-resolution image of that same area of coverage to the TES-N DBO application.
- Telemetry: AFSERS-TENCAP provided a data stream (UDP) to TES-N that tells where the simulated U-2 is located at any given time.

This capability worked only briefly during TT03/FBE-K (last two days of CPX) because of a number of complex issues including an initial lack of mission plans, an initial lack of a required software script, errors in subsequent mission plans, and suspected software problems in TES-N

Several issues arose with regard to this simulation:

- There exists no capability in AFSERS-TENCAP to provide the "waterfall" type of display in the TES-N Screener application that one would get from a live U-2 aircraft.
- The AFSERS-TENCAP base imagery was a mix of 5- and 1-meter resolution stitched together, providing significantly better resolution in some areas (where there was 1-meter coverage) than the base imagery used in AutoSIGS and AFSERS-MUSE.
- Receiving and processing the AFSERS-TENCAP telemetry data, required that TES-N run a script custom built for the task that is, apparently, not part of the standard TES-N version 5.0.
- AFSERS-TENCAP simulated SAR imagery was illegible by TES-N.
    - Work-around, have simulated U-2 fly an ASARS sensor, produce EO images, and players pretend they were seeing SAR.

ELINT / ESM Attempts were made to send simulated ELINT/ESM from various M&S sources to the Tactical Data Dissemination System (TDDS) Network Management Center (TNMC) to be put onto the TDDS broadcast, with receipt of the broadcast on BLR via organic means, and processing of exercise/experiment ELINT using the GALE software in TES-N.

- Successful receipt was achieved from
    - JQUAD (Camp Smith, HI)
    - JSAF-ASSET (NWDC Newport, RI)
    - ISR UUV-CSIM (NUWC Newport, RI) (never successful going direct to TNMC but email draft TACELINT to ASSET Simms Hall then sent to TNMC.

- TES-N GALE was unable to receive, process, and display TACELINT messages from ISR UUV that reported an LOB.
    - These messages were apparently being received and processed by GCCS-M.
    - Work-around, the M&S operators in Newport sent the TACELINTs as very thin, elongated ellipses that would look like a single line on the display.

COMINT CPX: COMINT injects were to be crafted by Kunia Regional SIGINT Operations Center (KRSOC) scripters who were resident in the TT03 JECG at Camp Smith, HI. Injects would be sent via SI broadcast to BLR and received by a COMINT analyst using TES-N.

- COMINT injects were received only on SCI GCCS-M, as that is the way the BLR SCI architecture was configured.
    - The COMINT analyst at the SCI GCCS-M would receive the injects as emails, print them, and sneaker-net them to the TST team manning TES-N terminals.

FTX: KRSOC scripters could not stay for the FTX.

- COMINT injects were from the NWDC Facilitator crafting a GESNSER-level COMINT spot report, and emailing the report to as an "initial tipper".

Other issues prevented adequate COMINT for both CPX and FTX.

- TES-N does not have any true COMINT analysis tools (as does SCI GCCS-M).
    - C7F cryptologists have chosen to not use TES-N for COMINT analysis.
    - Consequently, none of the required connectivity (other than JWICS Intelink web-browsing access, and SCI-level chat) for using SCI TES-N was not in place for use during TT03/FBE-K.
- TES-N Information Support Server Environment Guard was non-functional on BLR.
    - Could not move data from the SCI to the GENSER side of TES-N.

5.6.3 TES-N Outputs

Target nomination messages (ATI.ATRs) to ADOCS and to TST Target Folder Server The objective was for the TST nomination analyst to use TES-N to create a target nomination message (in USMTF "ATI.ATR" format), and to send that nomination message (via SMTP) to the ADOCS server on BLR, and to the TST Target Folder server at NWDC. [ADOCS would receive the ATI.ATR from TES-N and, after parsing it, would send another ATI.ATR to the TST Target Folder server; the target folder for any given TES-N created TST nomination would have both the ATI.ATR directly from TES-N and from ADOCS].

- Considerable effort was required to get all systems interoperating correctly, TES-N LAN, ship's LAN/Exchange server, FBE-K WAN and Exchange servers, ADOCS mail server.
- Once set up properly, no problems were encountered until corrupted files in the TES-N Cross-INT filter database occurred due to log files being over-filled.
- Target Identification was a problem.
    - Inconsistencies existed in how target nominations were handled by ADOCS and how they were showing up in the TST Target Folder server.
    - Fault was in both TES-N and ADOCS, with inconsistencies in target line usage.

- ADOCS turned around an ATI.ATR with fields out of order and truncated.

Images related to target nominations to PTW for aimpoint refinement The objective was for the TST nomination analyst to attach the image or several images (e.g., video "chips" showing the TST) to the outgoing target nomination, and send the nomination simultaneously to three places:

- ADOCS to begin weapon-target paring and engagement processes.
- TST Target Folder server to either create a new target folder or update an existing target folder.
- PTW to begin the aimpoint refinement process.

The version of PTW used on BLR could not receive and parse ATI.ATR messages (i.e., did not have the DTMS software used in MC02/FBE-J). The work-around was supposed to be that the PTW operator would open the target folder after it had been created in the TST Target Folder server and pull down the images from there.

- TES-N does not allow images to be attached to outgoing ATI.ATRs.
  - All images captured, chipped, and saved (as NITF) in TES-N had to be manually transferred (FTP) to PTW. The PTW operator would then pull up the images and conduct aimpoint refinement, then save the images (as both JPEG and NITF) to a shared directory on the BLR IT-21 LAN.

Images related to target nominations to TST Target Folder Server The objective was for the TST nomination analyst to attach images to the outgoing target nomination so that the TST Target Folder server could add the image(s) to the TST's target folder.

- The new version 5.0 of TES-N software still cannot attach images to ATI.ATRs.
  - The workaround was to use MS Outlook to create a one-line ATI.ATR email (using the "TNO" line only) with subject line "Target", pull the image(s) from the shared directory and attach to the email, and send to the TST Target Folder server.
- TST Target Folder server worked well.
- The NWDC TST Target Folder server application was simple but powerful prototype.

U-2 mission plan creation and output to AFSERS-TENCAP A well-written help-tutorial on-line in TES-N's EMPS application was used to guide creation a mission plan to output to AFSERS-TENCAP for its use in providing a simulated feed of U-2 imagery and telemetry back to TES-N. The plan consisted of a navigation plan and a collection plan built using a specific set of collection requirements for a specific sensor type, associated with a specific aircraft tail number, flying a specific track, downlinking to a specific ground station.

- EMPS uses different maps than ITD.
- Not only does it load the maps from a different set of files, but the user interface (e.g., zoom, pan, etc.) is completely different (and very cumbersome).
- AFSERS-TENCAP can only reliably simulate ASARS sensors.
  - AFSERS-TENCAP could not ingest the initial U-2 mission plans built for the EO sensor packages (SYERS and SYERS 2).

DIOP of U-2 imagery and telemetry to ISRM (CPX) and ESSEX RTC (FTX) The objective in

CPX was to have the U-2 simulation coming into TES-N from AFSERS-TENCAP turned around to ISRM (a TES RTC) at Hickam AFB using the TES-N Data Input/Output Port (DIOP). The DIOP connectivity between BLR, ISRM, and ESX RTC tested successfully using recorded mission tapes and demo files built from actual U-2 missions specifically to demonstrate and train the DIOP capability when no live U-2 was airborne and downlinking.

- AFSERS-TENCAP simulation stream cannot be "DIOP'd".
    - AFSERS-TENCAP uses different processes (FTP for imagery and UDP for telemetry) to provide the inputs to TES-N than a live U-2 (which would be sending it through the CDL-N and CIP), thus the AFSERS-TENCAP feeds could not be turned around using DIOP.

File transfer to ISRM (CPX) and ESSEX RTC / RTC Lites (FTX) Because "DIOP" is only for the transfer of U-2 imagery that is being (or has just been) directly downlinked, other file types must be exchanged between TES-N and remotes like ISRM and RTCs using standard means such as FTP and SMTP. During FTX only, three RTC Lites were employed, one aboard the vSSN (virtual submarine simulator at NUWC, Newport, RI), one aboard the E2XV (Experimental Hawkeye-2003 surrogate van in the NWDC parking lot in Newport, RI), and one aboard the virtual DDX (at NSWC Dahlgren, VA).

- FTP and SMTP worked great.
- RTC Lites worked -- eventually.
    - RTC Lite at NUWC was fairly easy to get up, configuring the others was difficult.
    - The actual utility of RTC Lites to "virtual shooter" nodes remains indeterminate.

Cross-INT replication from TES-N to ISRM (CPX) and ESSEX RTC (FTX) Replication of TES-N's Cross-INT database was attempted to both ISRM (CPX) and the ESX RTC (FTX), but with very limited success.

- During CPX, Cross-INT was not replicated to ISRM due to ISRM instability problems.
- During FTX, Cross-INT was replicated to ESX RTC.
- Target Nominations created in TES-N are not replicated to ISRM / RTC.

5.6.4 COP Issues

TST location output to COP (i.e., Manual Contact to GCCS-M) for "tracking" and SA: The objective was for the TST nomination analyst to not only create an ATI.ATR as above, but to then use TES-N's rudimentary interface to GCCS-M to input the target into the COP as a track, for the situational awareness of ALCON, and to assist (theoretically) in the "tracking" of the TST while waiting for it to be engaged.

- The TES-N output to GCCS-M only worked for two days at the same rudimentary and suboptimal level at which it was working for MC02/FBE-J; for the remainder of TT03/FBE-K it was functionally inoperative.
- GCCS-M configuration on BLR was sub-optimal.
    - BLR had a wide variety of serious issues (e.g., different software versions from machine to machine), some of which took the entire event to straighten out.

- TES-N output to GCCS-M was inoperative on BLR for CPX.
    - Even with the new TES-N version 5.0, there was no improvement in TES-N's ability to output to GCCS-M from what was used in MC02/FBE-J.
    - A workaround with the TES-N's Cross-INT database was developed, then went down when nothing could be saved to that database.

GCCS-M COP Tracks into TES-N ITD In addition to TES-N's rudimentary capability to send "Manual Contacts" to GCCS-M, COP tracks can also be sent from GCCS-M to TES-N. The objective of attempting to do so was to provide a richer context of contacts, tracks, Blue ISR asset locations, etc. in TES-N for the analysts trying to find and fix TSTs.

- TES-N's incoming "Message and Data Log" showed a good number of incoming tracks from GCCS-M, but those tracks did not appear to be parsing into the TES-N ITD.
- When GCCS-M tracks coming into TES-N were able to be brought up on the ITD it did not display any track labels.
    - GCCS-M tracks in TES-N's ITD appeared in their proper locations but the symbols do not have any labels associated with them (e.g., no track names), making them all but functionally useless to the TST team.
    - TES-N symbology was used, which is based on MIL-STD-2525, not GCCS-M symbololgy

M&S simulated ISR asset display in GCCS-M COP By the end of FTX, all of the simulated Blue ISR assets active in M&S were simultaneously displayed on BLR's GCCS-M COP with appropriate labels (e.g., two ISR UUVs, two Predator UAVs, one U-2).

- This was the first time that this has happened in an FBE. The key enablers were very closely coordinated troubleshooting between the NWDC Facilitator, the FBE-K ATO builder, the M&S Director, and the GCCS-M Tech on BLR.

5.7 FIRES PLANNER OBSERVATIONS

These results are extracted from Appendix E. For a complete description of experiment planning and execution from the Fires planner viewpoint, see that appendix. Those deemed to have had the most significant impact on achieving the Fires Initiatives objectives are discussed here. The presentation in the appendix is an observation, a discussion, and a recommendation. The discussions are omitted or shortened here.

5.7.1 Sea Strike Operational Planning

Planning Directive No experiment directive was published for this FBE.

Discussion: The Planning Directive is a Rosetta stone of information that outlines responsibilities, functions, and path toward execution of an experiment event. Lack of this document can cloud fleet numbered responsibilities and makes "arrangements" for support non-binding and unofficial.

Recommendation: Use this instrument in every FBE and LOE that is conducted.

Forward FBEs and NWDC Fleet Presence Forward presence by the NWDC staff and key planners was lacking.

Discussion: Forward fleets require constant attention during the FBE planning process. During FBE Kilo, uniformed initiative leads were present at the forward fleet toward the end of the planning process, but many of the other key planners did not interact with the fleet on a substantial basis until they arrived for execution of the experiment.

Recommendation: Attempt to get key planners forward often in the planning process and ALWAYS hold the Final Planning Conference at the forward numbered fleet home location. This will leverage fleet interaction and participation.

Fleet Interface and Fleet Initiative Sponsors No uniformed numbered fleet sponsor (uniformed warfighter) for the Sea Strike Initiatives was identified or utilized.

Discussion: The Sea Strike Initiatives did not have substantive uniformed numbered fleet representation throughout FBE Kilo (planning and execution). Not having warfighter sponsorship at the numbered fleet level for FBE initiatives is unacceptable.

Recommendation: Use the experiment directive to outline the fleet sponsorship requirement and do not examine initiatives that do not have proper uniformed sponsorship within the numbered fleet staff.

5.7.2 Sea Strike Operational Execution

IKA Support IKA support to the FBE was minimized due to MBC participation in the 2nd Fleet LOE. There was no coordinated IKA support for FBE execution.

Discussion: No IKA lead planning or execution support for the FBE was responsible for many delays and training problems. Ad-Hoc /initiative level IKA measures had to be implemented on the fly to support FBE execution. To exacerbate this matter, no clear level of IKA support was ever articulated to the planners during the planning process.

Recommendation: Identify IKA (or other initiative area) participation level in FBE and ensure that it is maintained.

Fleet Execution Support Numbered fleet staff support was abysmal for the Sea Strike Initiatives. The promised JFACC support was also minimal and not what had been planned.

Discussion: This lack of support in all these area was the largest single factor in not realizing the experimental potential of the Sea Strike efforts in FBE Kilo. This could be seen during the planning process but was not corrected by the MBC uniformed staff.

Recommendation: Early and frequent interaction with the uniformed staff at the ACOS level is required for all initiatives in an FBE, especially within a forward numbered fleet.

5.7.3 Sea Strike Backdrop/Scenario

FBE overlay on Exercise Construct FBE Kilo construct only loosely fit Tandem Thrust 03.

Discussion: The overall FBE construct that was layered over the exercise construct was adequate for execution had the exercise construct been completed. Database testing for the event was woefully lacking and joint force (JFACC) participation was almost nonexistent. This resulted in errant databases (MIDB, AODB, BSCMs), that did not function properly.

Recommendation: Planner and technologies must participate in any exercise database testing events that are integrated into the FBE construct.

Exercise Augmentees C7F only received a small percentage (~30%) of the planned staff augmentation and component augmentation required to carry out the Sea Strike initiatives.

Discussion: Events beyond the control of both the MBC and the numbered fleet resulted in manpower shortages that greatly hindered the FBE effort. While these may have been unavoidable, they were foreseen. Prior to execution, manning go/no criteria need to be established and utilized to prevent execution of events just for the sake of "doing something."

Recommendation: Institute manning go / no go levels during the planning process. Do this in concurrence with the numbered fleet. Be prepared to not execute portions of an FBE if these criteria are not reached.

Scenario The FTX scenario did not match (very closely), the FBE Sea Strike live force scenario.

Discussion: This problem was due in most parts to the CJTF (C7F) fighting the sim and live scenarios together when they were designed to be separate. While it may be out of the MBC's control to drive this during execution, there is room to avoid this by proper prior planning, which was not the case in FBE Kilo. This problem is directly related to lack of numbered fleet involvement in the planning cycle.

Recommendation: Force a higher level of fleet experiment/exercise integration familiarization early and often in the planning process.

Assumptions and Required Products An assumption was made by the FBE planning staff that certain products required for FBE execution (AODB, MIDB, BSCMs, etc…) would be available.

Discussion: The database test was inadequate, resulting in errant information for use in the XC4I systems used during the FBE.

Recommendation: NWDC must participate with both planners and technologies in the database test process. If products required are substandard, then they must be identified and corrected prior to execution

5.7.4 Sea Strike Technical/xC4I

Shipboard System Specifications USS Blue Ridge has a 10 mb switch backbone that is connected via 155 mb links. This, along with inconsistent network card setting hindered ADOCS use during the FBE.

Discussion: Standard, shipboard LAN configurations that support ADOCS need to be established. This applies to switch, link, and network card settings on these machines. Hardware limitations may require platforms to set up multi-server configurations to reduce the effect of less modern network backbones.

Recommendation: Set ISNS ADOCS standards prior to install and configure

accordingly.

Recommended Shipboard System Configurations USS Blue Ridge's LAN will require specific ADOCS configurations to support usage on that platform.

Discussion: To reduce the effect of a less modern backbone, placement of ADOCS servers in a multiserver configuration and standardization of network interfaces is required.

Recommendation: Place ADOCS servers in the following spaces: JIC, JOC (master), JAOC. Configure these machines so they are all pointed at the switches where the clients they support reside.

ADOCS Recommend Software / Hardware Changes Many recommended changes to ADOCS were compiled during the FBE.

Discussion: ADOCS changes are indicative of command and control capability requirements that currently exist.

Recommendations:

Software

1. Ability to pair a target to an ITO mission via a button
2. Ability to highlights targets in Fires and JSTM managers when changes have occurred…alert?
3. A configurable Fires Manager (within the ADOCS GUI).
4. Add "hour glass" icon to ADOCS to display system working.
5. TST supported CDR indicator in JTSTM.
6. Hot link to ROE url.
7. Hot link to TST priorities url.
8. Creation of a Combat Assessment manager and removal of that function from the Fires/JTST managers.
9. Hot link to target folder url.

Hardware

1. Two (2) displays for ADOCS users that are doing target development and coordination

JFN interaction with ADOCS ATI.ATR target nomination from JFN was incomplete.

Discussion: ATI.ATR target nomination to JFN was incomplete and not really viable for usage. This problem needs to be fixed. It was identified over 2 years ago and is still a problem.

Recommendation: Detailed ADOCS – JFN testing to fix this problem. This should be completed in a lab setting vice waiting for another FBE.

5.7.5 Operational Road-Ahead and Other Recommendations

ADOCS Road Ahead for C7F / COMPACFLT / USPACOM ADOCS will be integrated into the PACOM C2 structure. FBE Kilo was a major event in this transition.

Discussion: ADOCS use in FBE Kilo was the first in a series of event that will proliferate ADOCS across the PACOM. Lesson learned from this effort should be passed on to facilitate a higher level of functionality in future PACOM events (IPD, TF04, CG04).

Recommendation: Pass detailed ADOCS report to PACOM via C7F and COMPACFLT to help this effort along. Report should be a NWDC/JPSD collaborative effort.

Time Critical Targeting Functionality Afloat The Xray Papa cell was an excellent test case for familiarization of the TCTF concept to the fleet.

Discussion: TCTF is a USAF program that outlines the C2 requirements and systems for conducting TCT operations. In support of JCC and JCC (Afloat), the USN needs to further refine this concept to support both joint and maritime forces from a flag configured platform.

Recommendation: Use TCTF Afloat a starting point for future Sea Strike initiatives.

Coalition Fires Experimentation Coalition shooter information requirements where not met by the RMG technology.

Discussion: The RMG technology and its approved rulesets did not allow the coalition forces to fully integrate with the other shooter platforms. This problem resulted in SA deficiencies on both sides of the guard.

Recommendation: Develop two paths for future coalition experimentation, one based on full network integration and the other based on LNO supported by US releasable C2 systems and backbone. Both are viable and critical to continued integration of coalition forces.

Xray Papa and Maritime Component Time Sensitive Targeting The Xray Papa cell identified a time sensitive targeting gap at the maritime component level that needs to be addressed.

Discussion: JFMCC's conduct of broad scale TST operations that are integrated with other components is beyond the traditional role of the Bravo Papa. A staff function at the operational level (JFMCC) that supports TST prosecution is required.

Recommendation: Integrate this effort with the TCTF effort described above to help identify maritime TST command and control requirements of the future.

5.8 JFN PROGRAM OFFICE RESULTS

During FBE-Kilo the JFN Program Office gathered information about the performance of that system. A report has been delivered to the Program Office and the following are excerpts from that report.

The Tandem Thrust specific analytical objectives for TT03 were based on PEO-IWS-6-C specific guidance on how to best support present and future implementation of TES-N systems to support warfighting. This analysis effort will provide information to the modeling effort and provide feedback to PEO-IWS-6-C to support future acquisition and fielding decisions.

Initially, the high level objectives for this experiment were:

- Document the Joint TES architecture and interoperability in order to provide operational and technical insight to modeling.
- Document TST timeline events in TT03 TES scripted combat operations.
- Document TES functionality and products in the IPB process.

- Contribution to Operational- and Tactical Level Situational Awareness
- Document the functions and capabilities of AFATDS and ADOCS in the JFN
- Provide insight to support system acquisition decisions as it supports the Distributed Common Ground Surface-Station concept (DCGS).
- Provide insight to operator training and JFN CONOPS development.

Because of a shortage of funds and the poor quality of some of the technical data, analysis was not conducted some of the objectives. Only the following of the above objectives were there minimally sufficient data to provide some analytical insight.

- Document the Joint TES architecture and interoperability in order to provide operational and technical insight to modeling.
- Document TST timeline events in TT03 TES scripted combat operations.
- Document TES functionality and products in the IPB process.
- Interface performance of TES-N with other systems (specifically, ADOCS).

5.8.1 **TST Thread Example**

In order to determine JFN performance, two detect-to-engage threads were tracked. Information from those threads is presented below.

TST Thread Example: (SA-15, 16 April 03)

Time (local)	Event
	Received 5 ELINT hits that correlated to a radar for an SA-15 site (SIPRnet Email from USS Blue Ridge)
	P3-AIP tasked (via JECG) to provide video in vicinity of the ELINT contacts. (SIPRnet Email from USS Blue Ridge)
	Video from P3 received and analyzed at JFN MFWS. Target was easily identified. (SIPRnet Email from USS Blue Ridge)
	JFN Image Analysts refined location and pass ELINT data to AOC (Hickam) (SIPRnet Email from USS Blue Ridge)
1240	ELINT Contact Report received from JFN (Blue Ridge) to ISR-M (Hickam) (CHAT Sidebar 12)
1240	TCT Chief and Deputy CCO discuss potential TST and attack options. Attack Ops requests initial target coordinates from Targeteer and requests Targeteer to provide potential platforms with load-outs on current ATO.
1246	Attack Coordinator prepares strike package options
1251	SIDO consults with TCT Chief regarding expected imagery and DMPI's
1257	TCT Chief briefs CCO and JFACC about SA-15.

1300 ISR-M Operator chats with JFN Operator (USS Blue Ridge) and tells them that strike package is prepared but imagery required for more precise coordinates and collateral damage assessment. (CHAT Sidebar 12)
1305 TCT Chief provides status brief for CCO and JFACC. JFACC decides that mensuration is not required because strike package calls for Laser Guided Bomb (LGB). JFACC "not worried about collateral damage because several DMPI's in vicinity of SA-15 were hit earlier in the day"
1308 ISR-M Operator chats with JFN Operator (USS Blue Ridge) and requests refined coordinates. Explains that JFACC does not want to wait for imagery. (CHAT Sidebar 12)
1309 JFN Operator mentions that he was unsuccessful in sending imagery and will forward coordinates. (CHAT Sidebar 12)
1310 ISR-M Operator receives refined coordinates from JFN Operator via Chat circuit and provides to SIDO and TCT Chief.
1310 Coordinates are passed to Attack Coordinator and JFACC directs immediate execution.
1311 TCT Chief discusses Phase II BDA Plan with SIDO
1313 TCT Chief requests JFN coordinate additional imagery for BDA. (CHAT Sidebar 12)
1318 JFN Operator reports that P3 tasked (via exercise controller) to provide additional video after the strike.
1325 Additional video collected and displayed on JFN. JFN Operator could not forward imager to ISR-M
1331 In response to queries from AOC (TCT Chief), JFN analyst reported that image showed black smoke from radar station – Destroyed. (CHAT Sidebar 12)
1331 Event Completed

TB0062

Time	Event	Data Source	Remarks
010404May	BR TES-N nominates CDCM transporter for targeting	ADOCS Mission History Logs	Dwell time is to 010604 May (2 hours)
010428May	J2 Ops states that refined coordinates are available for this target.	IRC Chat Logs	
010445May	The TST LNO asks the XP ISR Manager to ask E-2C to execute mission.	IRC Chat Logs	TST ADOCS is not working
010455May	E-2C identifies 2 x F/A-18C available for strike	ADOCS Mission History Logs	ATO lists A/C availability from 010430 to 010600May
010455May	XP informs TST staff that they must notify the XP prior to using Navy assets.	IRC Chat Logs	Possible C2 procedure issue.
010457May	E-2C states to XP that he has been double tasked for the same target	IRC Chat Logs	

Time	Event	Data Source	Remarks
	both by the XP and the JTF TST		
010505May	TST LNO requests best TOT time from E-2C for sortie 1025.	IRC Chat Logs	
010513May	J2 Ops tasks UAV for BDA on target.	IRC Chat Logs	
010500May	E-2C states that TOT was 0520.	IRC Chat Logs	
010533May	BDA Imagery in target folder. Assessment is "unrepairable, possible scrap….catastrophic damage..,"	ADOCS Logs	

The decision event timeline for the F2T2EA process of TB0062 shows a target executed in 89 minutes. This process is within the 120 minute assigned dwell time. This time starts when the JIC nominates a target for execution. The JIC continuously monitors the event as evidenced by informing operations that geo-refinement coordinates are available and by tasking an UAV for a BDA mission.

TB0041

Time	Event	Data Source	Remarks
290318 Apr	BR TES-N nominates a radar for targeting	ADOCS Mission History Logs	
290323Apr	Target assigned a dwell time from 290418 to 290518Apr	ADOCS Mission History Logs	
290341Apr	JTF ISR asks if TST watch if they need Rivet Joint or U2 support	IRC Chat Logs	Based on whether target is DF because of COMINT. Declines offer because of Predator availability
290341Apr	COMINT reported firing sites in vicinity of Central Defense Command Center.	ADOCS Mission History Logs	
290349Apr	XP notifies E-2C that a SAM has been located over target.	IRC Chat Logs	
290351Apr	XP asks Targeting Officer for geo-refined coordinates.	IRC Chat Logs	Target folders for this target cannot be found. Queries JIC
290352Apr	ISR Mgr assigns UAV 1 to cover target area	IRC Chat Logs	
290353Apr	XP queries E-2C if there	IRC Chat Logs	

Time	Event	Data Source	Remarks
	are air assets available to strike target.		
290356Apr	XP begins coordination with ANZAC on assigning them target.	IRC Chat Logs	
290358Apr	E-2C states that target is a CDCM, not SAM.	IRC Chat Logs	XP directs E-2C to nominate as target. Target being worked by 2 platforms.
290401Apr	E-2C requests imagery.	IRC Chat Logs	XP states that imagery is not available. JIC having problems with target folders.
290403Apr	UAV on station. Operator begins sending reports.	IRC Chat Logs	
290415Apr	JFMCC is taking control of the target	ADOCS Mission History Logs	E-2C not informed.
290424Apr	TST LNO reports ADOCS technical problems.	IRC Chat Logs	Apparent problem with different Zulu times affecting the remarks section.
290427Apr	XP states that they are showing WTP ANZAC-ERGM on ADOCS	IRC Chat Logs	Still confusion on ANZAC concerning when to execute. ANZAC can only collaborate on ADOCS in TCT, XPA, WRD and FRD. Other blocks must be transmitted via voice communications.
290439Apr	ANZAC executes mission.	IRC Chat Logs	ADOCS Mission History records following: JFACC WTP at 290433Apr; MCC (ANZAC) WTP at 290420Apr.
290512Apr	XP requests target intelligence from JIC.	IRC Chat Logs	
290520Apr	JIC confirms that UAV1 is tasked for BDA	IRC Chat Logs	

The target TB0041 timeline documents the F2T2EA process for a coalition decision making event. Timeline for execution is 122 minutes. What is noteworthy for this event is how the target is processed by 2 separate entities (E-2C for an airstrike and the JFMCC for a surface fires strike). There are indications that initially there is a lack of synchronization by both entities. There seems to be some confusion on whether the target is a CDCM or SAM. This confusion may have delayed the decision making time (can be surmise that the E-2C may have been reluctant to send aircraft into the vicinity. What is finally resolved is that the ANZAC will be the primary shooter with strike fighters providing back-up. This target apparently is developed

from COMINT sources. However, there seems to be a cueing process as a Predator is tasked to surveil the target and ELINT ISR sources are not employed. There is a problem with imagery availability from the target folders that may have slowed the process.

5.8.2 Findings and Conclusions

These findings deal with the following questions:

- How do TES products contribute to the IPB process?
- Do TES products enhance predictive analysis of enemy course of action?

This analytical objective focused on the process and configuration of TES, GCCS-M and ADOCS as they relate to the IPB process in the Joint Intelligence Center (JIC). Doctrinally, IPB provides a systematic, continuous process of analyzing the threat and environment in a specific geographic area. It is designed to support staff estimates and military decision making. Applying the IPB process helps commanders selectively apply and maximize his combat power at critical points and times in the battlespace.

The JIC intelligence staff was surveyed on whether the JFN enhanced the IPB process and TST operations. The specific focus of JFN enhancements was TES. There were certain constraints to the experiment that may have influenced their opinion. These constraints include manning, training, and scenario relevancy. While the sample was small; there were some insights that emerged.

25% of the respondents agreed and 75% of the respondents indicated that TES aided in identifying gaps in the commands knowledge of the threat and the current threat situation.

25% of the respondents agreed and 75% of the respondents had no opinion that TES products were used to portray threat models that included doctrinal templates. Additionally, the same percentages were reflected in the respondents' perception of TES products usefulness in developing models that depicts threat courses of action.
25% of the respondents agreed and 75% of the respondents had no opinion on ADOCS usefulness in providing TST operations situational awareness.

25% of the respondents disagreed and 75% of the respondents had no opinion that ADOCS provided useful information to continuously update the enemy situation template.

All respondents agreed or strongly agreed that there was effective coordination between the TES imagery screener, the ELINT screener, and the video screener.

All respondents agreed that the imagery analyst processed imagery accurately and timely.

50% of the respondents agreed and 50% of the respondents had no opinion that the configuration of the JFN systems in the JIC was sufficient to ensure fusion of intelligence was accurate and timely for targeting.

25% of the respondents agreed and 75% of the respondents had no opinion that JFN provided the tools to fuse products that would answer the commander's priority intelligence requirements.

All respondents agreed or strongly agreed that the configuration of the JFN systems in the JIC was sufficient to facilitate collaboration between different functions.

50% of the respondents disagreed and 50% of the respondents had no opinion that track elements on the TES Integrated Tactical Display (ITD) were the same as the GCCS-M COP.

66.66% of the respondents disagreed and 33.33% of the respondents had no opinion that ADOCS and JFN systems provided situational awareness of theater wide ISR operations.

75% of the respondents agreed and 25% of the respondents had no opinion that the JIC provided targeting data to the JAOC and XP to support TST operations.

All of the respondents disagreed that the JFN systems were technically reliable.

Conclusions:
Several constraints to the data collection and analysis efforts preclude making definitive conclusions. These constraints include: small sample size; technical difficulties; control of the experimental design; and adequate manning. However, there are several insights that can be extracted form the data.

TES capabilities have the potential to contribute to the IPB process. Noteworthy was TES contribution to portray threat models that included doctrinal templates, and their usefulness in developing models that depicts threat courses of action.

There was not any data to support confidence in that TES and GCCS-M had a common picture of the friendly and enemy situation.

There were indications that the configuration of the JIC was sufficient to ensure that capabilities of different systems could be applied to fusion of intelligence products.

Technical performance was a significant factor the limited optimal operational capabilities.

A second high-level analytical objective dealt with interface performance of TES-N with other systems. Difficulties covered previously in this report prevented gathering adequate information to draw conclusions about this topic.

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6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS AND RECOMMENDATIONS CONTEXT

The analysis and reporting contained here for FBE-Kilo is different than what has been done for previous FBEs. Formerly, the concentration was on operational and tactical processes, how well they could be performed. Analysts and subject matter experts worked with data and information that had been obtained with a focus on decision-making, speed of performance, those things that lead to improved operational capabilities. In FBE-Kilo planning, personnel, and equipment problems that have been described in former sections and Appendices resulted in processes not being performed in a way that would yield much in the way of usable process data or information.

As a result, the majority of the results and conclusions presented here deal with experiment conduct and supporting equipment. Information about operational processes that can be gleaned is presented but represents a small part of the whole.

Because of the unusual nature of this experiment noted above, the most valuable observations and information are from those people responsible for performing the events and for making the equipment work. Three high quality, detailed, and comprehensive reports on the experiment's conduct and equipment have already been written by these people (see Appendices C, D, and E). Some of the conclusions and recommendations presented here are extracted from those appendices, others come from direct observations by the analysts who observed the experiment. Those who wish to understand the details of FBE-Kilo should read completely the three appendices. The extractions presented here cover their main points in abbreviated fashion. They have included other observations that are not presented here.

Conclusions are presented as Findings and Insights and many of them are accompanied by recommendations. An overarching recommendation for the Fires Initiatives is that the results from FBE-Kilo be used to step back, assess, and improve the Navy experimentation process. If this is done, the Kilo experience will prove to be worthwhile.

Four Findings from the CPX phase of FBE-Kilo are included with the Principal Conclusions and at the end of this section. They are included because of their applicability to all of the experiment.

6.2 PRINCIPAL CONCLUSIONS AND RECOMMENDATIONS

Principal Conclusions are first presented in a format meant to facilitate their use for presentations. Each area of interest conclusions are presented on a single page with highlights in a box, as might be used for a view graph or Power Point, followed by a brief explanation of each point.

Principal Findings are presented in the following order:

Experiment (3)

Coalition (3)
Fires (5)
TST Organization (1)
FBE Data (1)
Technology (4)
CPX Extraction (4)

The numbers in the parentheses are the numbers of findings types in each category, a total of 21. The number is this large because Findings in each of the categories need to be presented to adequately represent FBE-Kilo results.

This ordering is used because the more important results from FBE-Kilo had to do with experiment performance. Because of the many difficulties that existed, initiative results were difficult to obtain. Equipment difficulties, including connectivity, caused many of the difficulties. They are presented last because they explain some of the initiative results presented before them.

A significant FBE-Kilo outcome was that a large number of experiment conduct and equipment improvements were identified. If the recommendations developed are implemented, a substantial improvement in experimentation will result.

FBE-Kilo, Field Training Exercise Phase

Experiment #1 – Experiment Planning

- No experiment planning directive.
  - Fleet support responsibilities unclear.
- NWDC staff forward presence lacking.
- No uniformed Fleet sponsor for Sea Strike.
- Lack of continuity between experiment Concept and exercise planning.

No experiment Planning Directive was published for this FBE-Kilo. It is a necessary document, supplying information that outlines responsibilities, functions, and path toward execution of an experiment event. Lack of this document can cloud numbered fleet responsibilities and makes "arrangements" for support non-binding and unofficial.

Forward presence by the NWDC staff and key planners was lacking for FBE-Kilo. Constant collaboration with the Fleet is needed during experiment planning. Uniformed initiative leads were present at the Fleet toward the end of the planning process, but many of the other key planners did not interact with the Fleet on a substantial basis until they arrived for execution of the experiment.

No uniformed Fleet sponsor (uniformed warfighter) for the Sea Strike Initiatives was identified for FBE-Kilo for planning and execution. Not having warfighter sponsorship at the numbered fleet level for FBE initiatives severely hampers planning and coordination.

A lack of continuity existed between the development of FBE-K concepts/initiatives involving ISR/JFN, and the actual FBE-K planning/implementation for FBE-Kilo. This discontinuity hampered the development of meaningful analytic questions, and the experimental techniques to help answer those questions.

FBE-Kilo, Field Training Exercise Phase

Experiment #2 – Experiment Preparation

- Some required products not available.
- Lack of document control.
- Lack of Fleet staff participation.
    - Both real-world operations and coordination impacts.
- Operational Sequence/Functional Flow Diagrams insufficient.
- COP development and management insufficient.

Some products required for FBE execution (AODB, MIDB, BSCMs, etc…) were not available. The test of the database was inadequate, resulting in errant information for use in the XC4I systems used during FBE-Kilo.

Like most previous FBEs, Kilo suffered from a lack of document control for most of the key coordinating documents. Early in the FBE planning stages, key coordinating documents (and their owners), should be identified and implemented an FBE-wide common methodology for the cooperative production, review, maintenance, and accessibility.

From the ISR perspective, FBE-Kilo degenerated almost completely into a JFN systems training event, largely because participation by C7F Staff and Fleet forces in the planning, preparation, and execution was constrained to such an extent as to preclude meaningful ISR and JFN-related experimentation. ISR and JFN related experimentation require numbered Fleet full buy-in and participation, particularly the operations (N3) staff. The focus needs to be on the experiment rather than on Fleet training/exercises.

Functional Flow Diagrams (FFDs) should be developed prior to (or in conjunction with) Operational Sequence Diagrams (OSDs). They describe who at which functional nodes need (or will provide) what information from (to) whom and why.

The COP in FBE-Kilo did not have explicit "ownership" by any initiative, and was not maintained to a level required to support ISR and JFN in support of TST. Early in the FBE planning stages it is necessary to identify who has responsibility for each of the many complex, interdependent functions that go into producing an accurate, stable COP from which players will be capable of "fighting the experiment".

FBE-Kilo, Field Training Exercise Phase

Experiment #3 – Experiment Go/No-Go

- Significant shortfalls to adequate experiment execution identified prior to FBE-Kilo.
- No process exists to decide whether or not to execute an experiment.
  - Personnel impacts.
  - Equipment impacts.
- A definite process for no-go is needed.
  - A process for comparing goals to capabilities would be required.

A combination of events provided warnings that FBE-Kilo could not be carried out as planned. These were both personnel shortages to man operational positions and equipment problems. It is not worthwhile, in hindsight, to discuss whether or not the experiment should have been conducted. The experience does indicate that a processes is needed for making a go/no-go decision.

Events as large as an FBE naturally build up a momentum toward execution that is almost irresistible. There does not exist a process to decide whether or not to execute an experiment. A definite process is needed that contains the following steps:

Examine current status.
Determine steps and effort needed to achieve full experiment requirements.
Determine what additional can be realistically achieved with resources available.
Determine projected status at the time of the experiment.
Make a go/no-go decision or proper level of scaling back.

A go-ahead decision requires that the projected status satisfies a pre-set level of personnel and system support to carry out an adequate experiment.

A decision would not have to be binary. It should be possible to scale back the experiment to what is achievable.

Implementing such a decision system would require a much better mapping of initiative requirements to system and process capabilities than is now available.

FBE-Kilo, Field Training Exercise Phase

Coalition #1 – Radiant Mercury Guard

- Rule set did not use the latest message format used in ADOCS
  - Not all data could be transferred

RMG bridged the security boundary between the SECRET US NOFORN and SECRET AUSCANUKUS releasable networks. Due to budget and time constraints for accreditation of RMG, a previously approved rule set was used.

- This rule set did not use the latest message format used in ADOCS.
    - Not all of the data sent through RMG from SECRET US NOFORN ADOCS was transferred to the Coalition network.
- GCCS-M COP was transmitted effectively across RMG.

Radiant Mercury Guard was used to filter and transfer structured messages for FBE-K. To exchange unstructured messages (Chat, e-mail, VoIP, web pages) between U.S. and Coalition systems, a human-in-the-loop 'air gap' (Sneaker-Net) was utilized. Information from U.S. was reviewed and relevant information for Coalition was transferred across the boundary.

- Utilized due to the lengthy approval process for an automatic filtering system.
- Using Sneaker-Net, a direct transfer of chat messages was not maintained.
- Delay in message transfer was not the major issue for this system.
- E-mail volume did not increase the delay of chat message transfer.

The air gap between the Coalition IRC net and FBE IRC net systems:

- Introduced latencies of typically about seven minutes.
- Was manpower intensive to pass information across the gap.
- An automated filter (e.g. ISSE Guard) is required.

The transfer of web page information was complicated and a significant amount of time was used for this process.

- As with Chat, the reliance on web portals to provide access to information necessitates a better solution to the problem of integrating coalition partners.

FBE-Kilo, Field Training Exercise Phase

Coalition #2 – Coalition Fires TTP

- No defined tactical C2 process for coordinated Fires.
  - Operator confusion at ANZAC and Coalition Cell.
  - Work focused on understanding process.
  - Planned training not achieved.

The most significant issue encountered by Coalition was the absence of a clearly defined, tactical level, step-by-step process for the command and control coordination of fires.

- Creation of a step-by-step process for fires coordination part way through the FTX was too late.
  - Discussion was focused on understanding processes and not on improving it.
- Operator confusion at ANZAC and at the Coalition Cell was high, which lead to lengthy chat and VoIP communications for clarification.

The lack of SOPs for the fires coordination process, together with the continued presence and efforts to resolve ADOCS integration issues essentially undermined all unit and higher-level training. The result was the on-going confusion experienced by the Coalition team in the fires coordination process.

FBE-Kilo, Field Training Exercise Phase

Coalition #3 – ADOCS and RMG

- Full integration of ADOCS across RMG not achieved.
  - ANZAC GISRC nominations not found in FBE ADOCS.
  - Nominations forwarded by IRC Chat.
- ADOCS and RMG protocols incompatible.

The RMG and ANZAC ADOCS interface apparently had problems.

- The ANZAC ADOCS operators attributed coordination blocks defaulting to white to RMG.
  - Resulted in ANZAC transmitting, by IRC, to the Blue Ridge desired coordination block actions that were inserted in the ANZ coordination block by a Blue Ridge ADOCS operator.
- No ANZAC GISRC target nominations were found in the ADOCS FBE net servers. ANZAC GISRC target nominations were made.
  - The reason why these nominations were not seen in the FBE net ADOCS is unknown.

Although the majority of ADOCS problems noted during the final OSD testing were resolved, other issues became apparent during experiment execution.

- Full integration of ADOCS across the boundary between the SECRET US NOFORN and SECRET AUSCANUKUS releasable networks was not achieved.
  - Delays in the updates to Coalition ADOCS from Blue Ridge were unacceptable.
- Post experiment review of the network architecture revealed the cause of the update delays to be a constraint in the ADOCS server network and the underlying protocol used for ADOCS communications

FBE-Kilo, Field Training Exercise Phase

Fires #1 – TES-N

- Powerful system of potential great use for Navy TST.
- Developmentally immature.
  - Limited interfaces to other TST C4I systems.
  - Handling of ISR video and platform sensor telemetry.
  - SCI analysis tools and SCI to GENSER connectivity.
- System improvements required before further experimentation.

FBE-K demonstrated that TES-N has a number of powerful tools (some of which are unique to TES-N) that potentially could be of great use to Naval forces involved in Time Sensitive Targeting (TST). Unfortunately, FBE-K reconfirmed that TES-N remains a very complex and developmentally immature system, with extremely limited interfaces to other C4I systems that are critical to TST. Major advances are needed for the following:

- Interface with ADOCS or other TST Command and Control system
- Interface with GCCS-M
- Interface to PTW and any external target folder applications
- Handling of ISR video and platform/sensor telemetry

SCI COMINT analysis tools and SCI-to-GENSER connectivity via ISSE Guard

The presented target detection and identification problem from simulated video was unsatisfactory and unrealistic due both to the nature of the simulated imagery and TES-N processing of the imagery. This is an equipment problem identified elsewhere, but it also indicates the need for additional human factor engineering so that efficient usage of imagery can occur. Specific problems include:

- Video quality was poor and the displayed target coordinates could not be read
- The chipped images were of low resolution and unsuitable for georefinement.
- TES-N could not process the telemetry data that accompanied the imagery. This slowed and complicated the target nomination process.

TES-N shouldn't be used in further TST experimentation until improvements are made in the above areas. In its present state of development, experimentation results focus on system needs rather than TST process.

FBE-Kilo, Field Training Exercise Phase

Fires #2 – ADOCS for TST C2

- Extensive input/output typing cumbersome.
    - Need an AEGIS or AWACS type methodology.
- Target prioritization scheme needed.
- Pending actions notification needed.
- Currently inadequate for TST

Systems engineering of a TST C2 System should look beyond the extensive typing input-output approach in ADOCS, and its matrix displays, for TST coordination status. It became apparent during FBE-K that many of the C2 processes in ADOCS are complicated, difficult to define unambiguously, challenging to train to, and highly dependent on internet chat and voice elaboration. FBE-K raised the question if the ADOCS approach is the right concept to be applied to Joint TST. Some of the functionality built into air defense command and control systems, such as AEGIS or AWACS should be examined for applicability to ground TSTs.

The TST C2 System needs a TST prioritization scheme that takes into account both the importance of the target and the amount of time that it will be available for engagement. There is a non-mandatory block in ADOCS for target priority. Some units made their own inputs there. Most didn't. There are static priority categories listed in the CJTF TST matrix, but those numbers don't take into account the amount of time available to engage the target.

The TST C2 System needs to explicitly tell operators which tasks are theirs to perform and their priority. The ADOCS approach of one big table for MISSION FIRES COORDINATION and one big table for the JOINT TIME SENSITIVE TARGETS MISSIONS is not well engineered for people performing required tasks.

- JFMCC, the JFACC, the JFACC TST cell, X-Ray Papa, and others need to distinguish which targets on the list are their responsibility and which are someone else's.
- They also need to see if there is some action for them to take.
- They have no list of pending actions.
- There is no prioritization of actions waiting to be performed.

FBE-Kilo, Field Training Exercise Phase

Fires #3 – Common Operational Picture

- All M&S produced assets displayed in GCCS-M, first time achieved.
- TES-N could not output to GCCS-M.
- GCCS-M to TES-N tracks appeared, but with no labels.
- COP not maintained as required to support ISR and JFN for TST.
    - Different pictures always existed in GCCS-M, ADOCS, TES-N.

By the end of FTX, all of the simulated Blue ISR assets active in M&S were simultaneously displayed on BLR's GCCS-M COP with appropriate labels (e.g., two ISR UUVs, two Predator UAVs, one U-2). This was the first time that this has happened in an FBE.

Manual Contacts were to be transferred to GCCS-M for "tracking" and SA. The objective was for the TST nomination analyst to not only create an ATI.ATR, but to then use TES-N's rudimentary interface to GCCS-M to input the target into the COP as a track, for the situational awareness of ALCON, and to assist (theoretically) in the "tracking" of the TST while waiting for it to be engaged.

- The TES-N output to GCCS-M only worked for two days only, and at the same rudimentary and suboptimal level at which it was working for MC02/FBE-J.
- Even with the new TES-N version 5.0, there was no improvement in TES-N's ability to output to GCCS-M from what was used in MC02/FBE-J.

In addition to TES-N's rudimentary capability to send "Manual Contacts" to GCCS-M, COP tracks can also be sent from GCCS-M to TES-N. The objective of attempting to do so was to provide a richer context of contacts, tracks, Blue ISR asset locations, etc., in TES-N for the analysts trying to find and fix TSTs.

- TES-N's incoming "Message and Data Log" showed a good number of incoming tracks from GCCS-M, but those tracks did not appear to be parsing into the TES-N ITD.
- When GCCS-M tracks coming into TES-N were able to be brought up on the ITD they appeared in their proper locations but the symbols do not have any labels associated with them (e.g., no track names), making them all but functionally useless to the TST team.

Post-experiment analysis of logged data showed that different information appeared in GCCS-M, ADOCS, and TES-N. In effect, this means there was never a "Common" Operational Picture.

FBE-Kilo, Field Training Exercise Phase

Fires #4 – ADOCS Managers

- ADOCS managers have inconsistencies and latencies.
  - Inhibit and defeat TST engagement process.
  - Some events missing from histories.
- Consistent color coding system needed.

The ADOCS Managers exhibit inconsistencies and latencies that at times inhibit and occasionally defeat the TST engagement process. Specific problems observed include:

- Missions appear in some ADOCS workstations but not others.
- The coordination block status can be different at different ADOCS workstations.
- The mission status (e.g. fired or not fired) may be different in the Mission Coordination: Fires and JTST Managers. For the JFMCC/XP the ADOCS Mission Coordination: Fires Manager is the primary tool for prosecution of TSTs. The JTST Manager is a collaboration tool to provide TST situational awareness to all Components.
- The Mission Coordination: Fires and JTST Mission Histories can be inconsistent.
- Mission status as determined from the Mission History may not agree with the status in the Mission Coordination: Fires display.
- Some events are missing from the Mission Histories.
- There are multiple examples in the Mission Histories of coordination blocks being changed from colors that they do not hold. Two possible explanations for this are: there are events changing the block status that are missing from the Mission History log or the changes implemented at one ADOCS workstation were not received at a second workstation that subsequently acted on the block status.

For time-critical tasks, the TST C2 System color-coding should be standardized and intuitive so that operators will respond predictably and quickly. Color-coding is critical to using ADOCS as a coordination tool. Operators ended up inventing a color scheme for FBE-K, which is non-standard because there are no standards. This isn't merely a training or doctrine issue. Because color-coding is being used for coordination of time-critical tasks, the colors or symbols used should be engineered to be much more intuitive than they are. Ideally, as intuitive as real traffic lights so that people will respond predictably, and quickly.

FBE-Kilo, Field Training Exercise Phase

Fires #5 – Fires TTP

- Frequent, and serious departures from Fires TTP.
  - Player confusion.
  - ADOCS latencies and inconsistencies.
  - TES-N operators lack of training.

Frequent and serious departures from the Fires TTP were, in part, stimulated by player confusion or misunderstanding regarding procedures and by the ADOCS displays latencies and inconsistencies. Departures of the following nature were observed in ADOCS coordination block actions:

- Required TTP actions were not taken.
- Actions taken but not by the responsible node.
- Actions taken that are undefined by the TTP and hence meaningless.
- Actions executed in the wrong sequence.
- Actions executed in such a way as to indicate that the actions were taken to force the engagement to a conclusion rather than as a result of a realistic response to the simulated engagement.

FBE-Kilo, Field Training Exercise Phase

TST Organization

- Xray Papa good organization for TST Afloat testing.
  - Adaptation of Air Force TCT.
  - Maritime targeting gap identified.
  - Staff function at the JFMCC level required.

The Xray Papa cell was an excellent test case for familiarization of the Time Critical Targeting Functionality (TCTF) Afloat concept to the fleet. TCTF is a USAF program that outlines the C2 requirements and systems for conducting TCT operations. In support of JCC and JCC (Afloat), the USN needs to further refine this concept to support both joint and maritime forces from a flag configured platform. TCTF Afloat should be used as a starting point for future Sea Strike initiatives.

The Xray Papa cell identified a time sensitive targeting gap at the maritime component level that needs to be addressed. JFMCC's conduct of broad scale TST operations that are integrated with other components is beyond the traditional role of the Bravo Papa. A staff function at the operational level (JFMCC) that supports TST prosecution is required. Experimentation should integrate this development with the TCTF effort described above to help identify maritime TST command and control requirements of the future.

FBE-Kilo, Field Training Exercise Phase

FBE Data

- Less electronic data was available than in other FBEs.
  - No TES-N, GISRC, or PTW data produced for FTX.
- Cannot develop TST workflow.
  - Only 9 of 29 required data elements produced.
- Objective data requirements program necessary for experiment success.
  - Mandatory requirements and funding necessary.

Compared to other recent FBEs the objective data provided for this experiment was deficient in quantity and quality. In particular:

- The provided TES-N covered only a few days of the CPX and was reformatted so as to be unusable.
- No GISRC data were provided.
- The ADOCS JTST manager did not set capture mission histories for the last two days of the experiment
- After acquiring excellent mensuration data from RRF in FBE-J, FBE-K reverted to PTW which has never provided usable data.
- The JSAF event data logged in SNN did not include Fire events. There were gaps in the JSAF event data and/or many fire commands did not reach JSAF.

If workflow or timelines are to be a part of evaluating TST capabilities, adequate electronic data must be available from all systems that are part of the TST process, including simulations. Application of the following measures would do much to improve the collected objective data:

1. Require for system participation in an experiment that the system incorporate tools that log, identify and timestamp all significant operator actions.
2. Require data logging in formats that can be easily manipulated for analysis.
3. Include as an objective in pre-experiment integration testing the validation of the data logging applications.

Such a program will require funding be provided to system “owners”.

- Provide the funding needed for the data capture program.

FBE-Kilo, Field Training Exercise Phase

Technology #1 – Shipboard Systems

- Incompatibilities existed between shipboard systems and ADOCS
  - Backbone characteristics.
  - Inconsistent network card settings.

Need to establish LAN configurations that support ADOCS.

- Switch.
- Link.
- Network card settings.

USS Blue Ridge has a 10 mb switch backbone that is connected via 155 mb links. This, along with inconsistent network card setting hindered ADOCS use during the FBE. Standard, shipboard LAN configurations that support ADOCS need to be established. This applies to switch, link, and network card settings on these machines. Hardware limitations may require platforms to set up multi-server configurations to reduce the effect of less modern network backbones. ISNS ADOCS standards need to be set prior to an experiment install and configured accordingly.

FBE-Kilo, Field Training Exercise Phase

Technology #2 – ADOCS Recommendations

- Improvements needed to support C2 requirements.
- ADOCS software changes.
  - User interfaces.
  - Alerting.
  - Links to other information.
  - ATI.ATR messages.

Many recommended changes to ADOCS were compiled during the FBE. ADOCS changes are indicative of command and control capability requirements that currently exist. Software improvements are needed for:

1. Ability to pair a target to an ITO mission via a button
2. Ability to highlight targets in Fires and JTST Managers when changes have occurred…alert?
3. A configurable Fires Manager (within the ADOCS GUI).
4. Add "hour glass" icon to ADOCS to display system working.
5. TST supported CDR indicator in JTST Manager.
6. Hot link to ROE url.
7. Hot link to TST priorities url.
8. Creation of a Combat Assessment Manager and removal of that function from the Fires/JTST managers.
9. Hot link to target folder url.

Hardware

1. Two (2) displays for ADOCS users that are doing target development and coordination

ATI.ATR target nomination to between TES-N and ADOCS was incomplete and not viable for usage. Inconsistencies existed in how target nominations were handled by ADOCS and how they were showing up in the TST Target Folder server. The fault was in both TES-N and ADOCS, with inconsistencies in target line usage. ADOCS turned around an ATI.ATR with fields out of order and truncated. This problem needs to be fixed. It was identified over 2 years ago and is still a problem. This should be completed in the lab rather than waiting for another experiment.

FBE-Kilo, Field Training Exercise Phase

Technology #3 – JFN Recommendations

- JFN had mixed success supporting TST operations.
    - ELINT mixed success.
    - COMINT unsuccessful.
    - Cross-INT limited success.

ELINT/ESM was sent from various M&S sources to the TDDS Network Management Center, to be put onto the TDDS broadcast, with receipt of the broadcast on BLR via organic means, and processing of exercise/experiment ELINT using the GALE software in TES-N.

- Successful receipt was achieved
- TES-N GALE was unable to receive, process, and display TACELINT messages from ISR UUV that reported an LOB.

COMINT injects were sent via SI broadcast to BLR and received by a COMINT analyst using TES-N.

- COMINT injects were received only on SCI GCCS-M, as that is the way the BLR SCI architecture was configured.
- The COMINT analyst at the SCI GCCS-M received the injects as emails, printed them, and sneaker-netted them to the TST team manning TES-N terminals.
- TES-N does not have any true COMINT analysis tools (as does SCI GCCS-M).
- TES-N Information Support Server Environment Guard was non-functional on BLR.

Replication of TES-N's Cross-INT database was attempted to both ISRM (CPX) and the ESX RTC (FTX), but with very limited success.

- During CPX, Cross-INT was not replicated to ISRM due to ISRM instability problems.
- During FTX, Cross-INT was replicated to ESX RTC.
- Target Nominations created in TES-N are not replicated to ISRM / RTC.

FBE-Kilo, Field Training Exercise Phase

Technology #4 – JFN Recommendations 2

- JFN had mixed success supporting TST operations.
  - Target nomination messages.
  - Image management.
  - File transfers.

The TST nomination analyst used TES-N to create a target nomination message (in USMTF "ATI.ATR" format), and to send that nomination message (via SMTP) to the ADOCS server on BLR, and to the TST Target Folder server at NWDC. Considerable effort was required to get all systems interoperating correctly, TES-N LAN, ship's LAN/Exchange server, FBE-K WAN and Exchange servers, ADOCS mail server. Once set up properly the process worked well.

The objective was to attach images (e.g., video "chips" showing the TST) to the outgoing target nomination for aim-point refinement, and the nomination sent simultaneously to ADOCS, TST Target Folder, and PTW.

- The version of PTW used on BLR could not receive and parse ATI.ATR messages (i.e., did not have the DTMS software used in MC02/FBE-J).
- TES-N does not allow images to be attached to outgoing ATI.ATRs.
- All images captured, chipped, and saved (as NITF) in TES-N had to be manually transferred (FTP) to PTW.
- The PTW operator would pull up the images and conduct aimpoint refinement, then save the images (as both JPEG and NITF) to a shared directory on the BLR IT-21 LAN.

The TST nomination analyst was to attach images to the outgoing target nomination so that the TST Target Folder server could add the image(s) to the TST's target folder.

- TST Target Folder server worked well and the NWDC TST Target Folder server application proved to be a simple but powerful prototype.
- The new version 5.0 of TES-N software still cannot attach images to ATI.ATRs.

Because "DIOP" is only for the transfer of U-2 imagery that is being (or has just been) directly downlinked, other file types must be exchanged between TES-N and remotes like ISRM and RTCs using standard means such as FTP and SMTP.

- FTP and SMTP worked well.
- RTC Lites worked, with varying difficulty. RTC Lite at NUWC was fairly easy to get up, configuring the others was difficult.

FBE-Kilo, CPX

CPX PR#2 - Achievement of JFN Contributions to TST Objective

- No baseline without JFN available, cannot perform an adequate test.
- Equipment difficulties prevented adequate testing of JFN capabilities.
  - Lack of TES-N to ADOCS connectivity.
  - Failure of FBEnet.
- Only TES-N in the JIC was tested.

The stated JFN objective was to determine the contribution of JFN to TST prosecution. In order to determine JFN-unique contributions, or synergistic JFN effects, a baseline of performance without JFN is needed. Such a baseline requires using the same C2 structure and information processes as were used in the experiment. Baseline information is not available.

Equipment problems prevented testing end-to-end JFN performance. Target nominations could not be passed directly from TES-N to ADOCS, or directly to ISRM. FBEnet was not operational due to Ku Band switching problems in Hawaii. The result was that many information paths that are crucial for realizing JFN potential were not operational.

Because of the collection of equipment and manning problems the only comprehensive test of JFN that could be made was of the TES-N component in the JIC.

The basic objectives of this initiative could not be met. Results that could be derived are indications of JFN potential for TST processes within a JIC.

FBE-Kilo, CPX

CPX PR#3 - TES-N Capabilities

- Works well for IMINT exploitation.
  - Video screener a major factor in closing TST timeline.
  - Directing tactical imagery assets.
- Inability to drop validated aim points a major drawback.
- Improved sensor control by image analyst required.

Image analysis and processing worked well, essentially creating/producing an efficient assembly line. Operators, with little training, were able to explore images and make both analysis and processing decisions fairly quickly. (Difficulties encountered because of the simulation are covered in a subsequent Principal Result (in CPX Report).)

An important capability was for the image analyst to be able to direct tactical sensors. The analyst worked through a sensor manager and the process worked moderately well. There were difficulties with this sensor control, as implemented, in that there was no direct provision for sensor control at the analyst's terminal. A direct link that the analyst can use without interrupting, nor losing sight of, imagery is needed.

There were problems with imagery information content. Transmission of aim points and Lat-Long needs to be improved. This was done verbally or by notes, which slowed the process.

FBE-Kilo, CPX

CPX PR#5 - Operator's Acceptance of TES-N

- In spite of lack of familiarity, operators recognized the system's potential for improving performance and efficiency
- User-friendly and easy to learn.
- Much appreciation of several functions combined in one machine.

With the exception of the team leader, the TES-N operators were totally unfamiliar with the system and with TST processes. Their training was on IPB processes. Thus, they were being introduced to both a new system and a new process. In spite of this they were enthusiastic about TES-N.

They felt the system was easy to learn and that the graphical user interface (GUI) layout and methods of use were fairly intuitive.

The system layout was such that a terminal could be used for image screening, image analysis, or nomination. This allowed those operations to be exchanged or shared. Having multiple functions resident within one machine produced manpower savings as a result of increased work efficiency and direct sharing of information between operators.

FBE-Kilo, CPX

CPX PR#6 - TES-N Training Issues

- Current simulation hinders training.
  - Lack of reality interfered with all aspects of training and performance.
  - Simulation designed specifically for TES-N training needed.
- Operators need broad TST process training.

CPX was used to provide TES-N operator training in an operational context. But, the simulation used for the experiment presented unrealistic renderings of battlefield objects. This lack of realism interfered with operator performance and therefore with their training. In addition to low fidelity, the presentation of the battlefield was such that image analysts could not distinguish different instances of the same object type. This produced a situation where operators were moving back and forth between objects to figure out which was which, interfering with training.

A realistic simulation designed specifically for TES-N training is needed.

Operators did not have an understanding of the TST process. Training on the TST process was being conducted at the same time as how to do it. Training on the full TST process is needed as a prerequisite to system "knobology" training.

FBE-Kilo, CPX

CPX Recommendation H2.5 - Experiment Planning Stability

- Last minute changes interfere with experiment execution.
  - Addition of equipment.
  - Process modification or changes.
- Lock-down date for experiment plans needed.

This principal finding is derived from the CPX recommendation in this reports Section H2.5.

CPX was an unusual situation in that there were major changes in the experiment structure (e.g. lack of a JFACC Forward) shortly before the experiment, and then personnel shortfalls due to BLUE RIDGE departing early for the typhoon. However, it is not unusual in FBEs to have equipment and process changes occur right up to the beginning of an experiment. Such changes have many effects, such as:

Disrupt data capture and analysis plans.
Prevent capturing data required to meet Initiative objectives.
Cannot provide adequate training on added systems and processes.
Cannot adequately test added systems.

It is recommended that an experiment be "locked down" **four** months prior to its start. An exception would be when there is a series of events that includes an equipment testing LOE prior to the field experiment. In this case, the LOE should occur six weeks prior to the operational experiment and the lock-down occur within one week after the LOE.

6.3 COALITION INITIATIVE FINDINGS AND INSIGHTS

Radiant Mercury Guard (RMG) is a network security tool that was employed as a message filter between U.S. and Australian classified networks during FBE-Kilo. RMG scans message headers for key words and filters (does not pass) messages that contain information deemed inappropriate by a predetermined rule set. If RMG does not recognize a message type, it will not be passed.

6.3.1 ADOCS Network Messages

The ADOCS network, as deployed during FBE-Kilo, included the capability to generate and exchange prototype messages that could not be recognized by RMG. This was a known condition at the outset of the experiment. It was very detrimental to the objectives of the Initiative as it hampered both Fires process development and demonstration of Coalition Fires participation.

6.3.2 Coalition Fires TTP

The most significant issue encountered by Coalition was the absence of a clearly defined, tactical level, step-by-step process for the command and control coordination of fires.

- Creation of a step-by-step process for fires coordination part way through the FTX was too late.
    - Discussion was focused on understanding processes and not on improving it.
- Operator confusion at ANZAC and at the Coalition Cell was high, which lead to lengthy chat and VoIP communications for clarification.

The lack of SOPs for the fires coordination process, together with the continued presence and efforts to resolve ADOCS integration issues essentially undermined all unit and higher-level training. The result was the on-going confusion experienced by the Coalition team in the fires coordination process.

6.3.3 ADOCS Integration

Although the majority of ADOCS problems noted during the final OSD testing were resolved, other issues became apparent during experiment execution.

- Full integration of ADOCS across the boundary between the SECRET US NOFORN and SECRET AUSCANUKUS releasable networks was not achieved.
    - Delays in the updates to Coalition ADOCS from Blue Ridge were unacceptable.
- Post experiment review of the network architecture revealed the cause of the update delays to be a constraint in the ADOCS server network and the underlying protocol used for ADOCS communications

6.3.4 RMG Rule Set

RMG bridged the security boundary between the SECRET US NOFORN and SECRET AUSCANUKUS releasable networks. Due to budget and time constraints for accreditation of RMG, a previously approved rule set was used.

- This rule set did not use the latest message format used in ADOCS.
    - Not all of the data sent through RMG from SECRET US NOFORN ADOCS was transferred to the Coalition network.
- GCCS-M COP was transmitted effectively across RMG.

6.3.5 Chat, VoIP, and Sneaker-Net

Radiant Mercury Guard was used to filter and transfer structured messages for FBE-K. To exchange unstructured messages (Chat, e-mail, VoIP, web pages) between U.S. and Coalition systems, a human-in-the-loop 'air gap' (Sneaker-Net) was utilized. Information from U.S. was reviewed and relevant information for Coalition was transferred across the boundary.

- Utilized due to the lengthy approval process for an automatic filtering system.
- Using Sneaker-Net, a direct transfer of chat messages was not maintained.
- Delay in message transfer was not the major issue for this system.
- E-mail volume did not increase the delay of chat message transfer.

Transcribing messages between the XP cell on Blue Ridge and the ANZAC command team in Fern Hill led to some ambiguity in communication.

The air gap between the Coalition IRC net and FBE IRC net systems:

- Introduced latencies of typically about seven minutes.
- Was manpower intensive to pass information across the gap.
- An automated filter (e.g. ISSE Guard) is required.

VoIP was of high quality after network issues were resolved.

- VoIP was effectively utilized for technical troubleshooting and demonstrated a potential for use in tactical coordination.

The transfer of web page information was complicated and a significant amount of time was used for this process.

- As with Chat, the reliance on web portals to provide access to information necessitates a better solution to the problem of integrating coalition partners.

6.3.6 Interface Problems

The RMG and ANZAC ADOCS interface apparently had problems.

- The ANZAC ADOCS operators attributed coordination blocks defaulting to white to

RMG.
    - Resulted in ANZAC transmitting, by IRC, to the Blue Ridge desired coordination block actions that were inserted in the ANZ coordination block by a Blue Ridge ADOCS operator.
- No ANZAC GISRC target nominations were found in the ADOCS FBE net servers. ANZAC GISRC target nominations were made.
    - The reason why these nominations were not seen in the FBE net ADOCS is unknown.

6.4 FIRES INITIATIVES FINDINGS AND INSIGHTS

Findings obtained for the Fires Initiatives are qualitative rather than quantitative, and broad rather than specific. FBE-Kilo introduced the use of JFN, including TES-N, to Seventh Fleet personnel. Training on some of the component systems was conducted and Fleet personnel acceptance of the systems, and the possibilities they presented for improved operations, was documented. Indications of possible TST process improvement were obtained rather than a determination of what process and system use does and does not work. Definitive recommendations for needed system and process improvements before JFN can achieve the needed level of performance for TST have been identified.

6.4.1 System Improvements

FBE-Kilo produced a significant number of recommendations for system improvement. A number of these had already been identified in former experiments. Whether confirming/ identifying needed improvements justified the time and expense of this FBE is an unanswered question. It is clear that doing another experiment without these improvements would not be justified.

Recommendation: Make the identified JFN system improvements before conducting another TST field experiment with this system and/or its components.

6.4.2 Tactical Exploitation System – Navy

Needed Improvements FBE-K demonstrated that TES-N has a number of powerful tools (some of which are unique to TES-N) that potentially could be of great use to Naval forces involved in Time Sensitive Targeting (TST). Unfortunately, FBE-K reconfirmed that TES-N remains a very complex and developmentally immature system, with extremely limited interfaces to other C4I systems that are critical to TST. Major advances are needed for the following:

- Interface with ADOCS or other TST Command and Control system
- Interface with GCCS-M
- Interface to PTW and any external target folder applications
- Handling of ISR video and platform/sensor telemetry

- SCI COMINT analysis tools and SCI-to-GENSER connectivity via ISSE Guard

Target Detection and ID The presented target detection and identification problem from simulated video was unsatisfactory and unrealistic due both to the nature of the simulated imagery and TES-N processing of the imagery. This is an equipment problem identified elsewhere, but it also indicates the need for additional human factor engineering so that efficient usage of imagery can occur. Specific problems include:

- Video quality was poor and the displayed target coordinates could not be read
- The chipped images were of low resolution and unsuitable for georefinement.
- TES-N could not process the telemetry data that accompanied the imagery. This slowed and complicated the target nomination process.

6.4.3 ADOCS Managers

The ADOCS Managers exhibit inconsistencies and latencies that at times inhibit and occasionally defeat the TST engagement process. Specific problems observed include:

- Missions appear in some ADOCS workstations but not others.
- The coordination block status can be different at different ADOCS workstations.
- The mission status (e.g. fired or not fired) may be different in the Mission Coordination: Fires and JTST Managers. For the JFMCC/XP the ADOCS Mission Coordination: Fires Manager is the primary tool for prosecution of TSTs. The JTST Manager is a collaboration tool to provide TST situational awareness to all Components.
- The Mission Coordination: Fires and JTST Mission Histories can be inconsistent.
- Mission status as determined from the Mission History may not agree with the status in the Mission Coordination: Fires display.
- Some events are missing from the Mission Histories.
- There are multiple examples in the Mission Histories of coordination blocks being changed from colors that they do not hold. Two possible explanations for this are: there are events changing the block status that are missing from the Mission History log or the changes implemented at one ADOCS workstation were not received at a second workstation that subsequently acted on the block status.

6.4.4 Fires TTP

Frequent and serious departures from the Fires TTP were, in part, stimulated by player confusion or misunderstanding regarding procedures and by the ADOCS displays latencies and inconsistencies. Departures of the following nature were observed in ADOCS coordination block actions:

- Required TTP actions were not taken.
- Actions taken but not by the responsible node.
- Actions taken that are undefined by the TTP and hence meaningless.

- Actions executed in the wrong sequence.
- Actions executed in such a way as to indicate that the actions were taken to force the engagement to a conclusion rather than as a result of a realistic response to the simulated engagement.

6.4.5 Common Operational Picture

A common operational picture is non-existent. In FBE-K a COP was not maintained to a level required to support ISR and JFN in support of TST. Different pictures always existed in GCCS-M, ADOCS, and TES-N.

6.4.6 ADOCS as the TST Command and Control System

Alternative Approaches to Time Sensitive C2 Systems engineering of a TST C2 System should look beyond the extensive typing input-output approach in ADOCS, and its matrix displays, for TST coordination status. It became apparent during FBE-K that many of the C2 processes in ADOCS are

- complicated,
- difficult to define unambiguously,
- challenging to train to, and
- highly dependent on internet chat and voice elaboration.

ADOCS is an Advanced Concept Technology Demonstration (ACTD), but the challenges evident in FBE-K raise the question if the ADOCS approach is the right concept to be applied to Joint Time Sensitive Targeting. Because of the time-sensitivity of the targets and because it is at the tactical level of war, some of the functionality built into air defense command and control systems, such as AEGIS or AWACS should be examined for applicability to ground TSTs.

Target Prioritization The TST C2 System needs a TST prioritization scheme that takes into account both the importance of the target and the amount of time that it will be available for engagement. There is a non-mandatory block in ADOCS for target priority. Some units made their own inputs there. Most didn't.

- Procedures are needed for who is supposed to enter a priority. Most important are:
- What does the priority mean?
- How is it to be determined?

There are static priority categories listed in the CJTF TST matrix, but those numbers don't take into account the amount of time available to engage the target.
There are available simple mathematical models (formulas) for prioritization based on both target utility and probability that it will remain engageable for some period of time (one simple approach looks like economic discounting). Target prioritization needs to be addressed in TST command and control.

Pending Tasks The TST C2 System needs to explicitly tell operators which tasks are theirs to

perform and their priority. The ADOCS approach of one big table for MISSION FIRES COORDINATION and one big table for the JOINT TIME SENSITIVE TARGETS MISSIONS is not well engineered for people performing required tasks.

- JFMCC, the JFACC, the JFACC TST cell, X-Ray Papa, and others need to distinguish which targets on the list are their responsibility and which are someone else's.
    - This requires them to scan the list doing mental vertical sorting.
- They also need to see if there is some action for them to take.
    - This requires them to scan the table doing mental horizontal sorting.
- They have no list of pending actions.
- There is no prioritization of actions waiting to be performed.

TSTs That Move, Re-Position, and Change Status The TST C2 System needs functionality for automatically and unambiguously keeping track of targets that move, re-position, and change status. ADOCS needs functionality added for targets that may move (allowing a track number to move with them so long as they are held by sensors), i.e., dynamic target position information rather than static data fields. Concurrently functionality is needed for automatic updating and alerting of decision makers and engagers. This shouldn't rely on voice or chat or typed-in remarks.

ADOCS functionality is also needed for other critical changes in target status, such as missiles transitioning from stowed to erected positions. This may require dynamic updating of target description, and certainly needs automatic updating and alerting of decision makers and engagers.

Human Systems Integration for Color-coding For time-critical tasks, the TST C2 System color-coding should be standardized and intuitive so that operators will respond predictably and quickly. Color-coding is critical to using ADOCS as a coordination tool. Operators ended up inventing a color scheme for FBE-K, which is non-standard because there are no standards. This isn't merely a training or doctrine issue. Because color-coding is being used for coordination of time-critical tasks, the colors or symbols used should be engineered to be much more intuitive than they are. Ideally, as intuitive as real traffic lights so that people will respond predictably, and quickly.

Human Systems Integration for Symbol-coding For time-critical tasks, the TST C2 System use of symbol-coding to supplement color-coding should be automated, streamlined, or eliminated. The coding scheme developed for ADOCS blocks includes an X in some blocks on top of the color. This scheme now requires two distinctly different sets of actions, one to set the color, and another sequence of actions to add the X when needed. This is not as streamlined and error-resistant as a time-critical process should be.

IRC Chat Entries The event timeline IRC entries sometimes show detailed reporting regarding the color block changes that are being made to the ADOCS display. This is attributable, in part, to uncertainty among some participants about the TST procedures and, in part, to the lack of confidence in ADOCS to accurately reflect, in a timely manner, the operator block actions to all ADOCS workstations.

- These detailed communications result in an expansion of the engagement timeline and, in effect, make ADOCS redundant.
- All the coordination actions appear to be occurring in chat and ADOCS becomes unnecessary.

Target Georefinement Target georefinement was not played as an integral part of this experiment. In previous FBEs ADOCS was the tool that requested, displayed and logged mission georefinement status. This function of ADOCS was not a component of Fires play in FBE-K.

6.4.7 Equipment Casualty Modes

The TST C2 System needs to have reliable alternative modes of operation and more graceful degradation than is currently available with open-architecture LANs and internet-style networks. Most legacy combat systems have casualty modes. Some have several levels of casualty modes. There is a risk that the down-time and network problems encountered in FBE-K may not be atypical of what might occur in the real world with leading edge technologies, pushing the envelope, built on open-architecture machines and networks.

6.5 DOTMLPF IMPACTS

No DOTMLPF impacts can be deduced from this experiment.

6.5.1 Hardware Program Impacts

There are recommendations contained in this report that have an impact on hardware system program management. System performance and compatibility issues are hindering obtaining operational benefits that should be realized from some of the new systems. Some of these issues are long standing and should be addressed before further experimentation with them is carried out. Details are contained throughout the report, particularly in Sections 6.8, 6.9, 6.11, and Appendices C and E.

6.6 EXPERIMENT PLANNING LESSONS LEARNED

Planning Directive No experiment Planning Directive was published for this FBE-Kilo. It is a necessary document, supplying information that outlines responsibilities, functions, and path toward execution of an experiment event. Lack of this document can cloud fleet numbered responsibilities and makes "arrangements" for support non-binding and unofficial.

Recommendation: Use this instrument in every FBE and LOE that is conducted.

Forward FBEs and NWDC Fleet Presence Forward presence by the NWDC staff and key planners was lacking for FBE-Kilo. Constant collaboration with the Fleet is needed during

experiment planning. Uniformed initiative leads were present at the Fleet toward the end of the planning process, but many of the other key planners did not interact with the Fleet on a substantial basis until they arrived for execution of the experiment.

Recommendation: Insure key planners are forward often in the planning process and hold the Final Planning Conference at the Fleet's home location.

Fleet Interface and Fleet Initiative Sponsors No uniformed Fleet sponsor (uniformed warfighter) for the Sea Strike Initiatives was identified for FBE-Kilo for planning and execution. Not having warfighter sponsorship at the numbered fleet level for FBE initiatives severely hampers planning and coordination.

Recommendation: Do not examine initiatives that do not have proper uniformed sponsorship within the numbered Fleet staff.

Continuity Between Concept Development and Experiment Implementation A lack of continuity existed between the development of FBE-K concepts/initiatives involving ISR/JFN, and the actual FBE-K planning/implementation for FBE-Kilo. This discontinuity hampered the development of meaningful analytic questions, and the experimental techniques to help answer those questions.

Recommendation: Those involved in the development of experimental concepts and initiatives remain fully engaged throughout the experiment planning process to ensure it is properly focused on addressing original intent.

6.7 EXPERIMENT PREPARATION LESSONS LEARNED

Required Products Some products required for FBE execution (AODB, MIDB, BSCMs, etc…) were not available. The database test was inadequate, resulting in errant information for use in the XC4I systems used during FBE-Kilo.

Recommendation: NWDC must participate with both planners and technologies in the database test process. If products required are substandard, then they must be identified and corrected prior to execution

Document Control Like most previous FBEs, Kilo suffered from a lack of document control for most of the key coordinating documents.

Recommendation: Early in the FBE planning stages, identify key coordinating documents (and their owners), and implement an FBE-wide common methodology for the cooperative production, review, maintenance, and accessibility.

Staff Participation; Fleet Training vs. Experimentation From the ISR perspective, FBE-Kilo degenerated almost completely into a JFN systems training event, largely because participation by C7F Staff and Fleet forces in the planning, preparation, and execution was constrained to such an extent as to preclude meaningful ISR and JFN-related experimentation.

Recommendation: Ensure ISR and JFN related experimentation involving a numbered Fleet has full buy-in and participation of that Fleet staff, particularly the operations (N3) staff. Focus experiments on experimentation, not on Fleet training/exercises.

Be prepared to postpone or cancel experimentation events that are dependent on Numbered Fleet staff participation as soon as it becomes obvious that the bulk of that staff's focus will and should be elsewhere other than on experimentation.

Operational Sequence Diagrams Functional Flow Diagrams (FFDs) should be developed prior to (or in conjunction with) Operational Sequence Diagrams (OSDs). They describe who at which functional nodes need (or will provide) what information from (to) whom and why.

Recommendation: Institutionalize FFDs as required documents for all experimentation events. The OSDs should subsequently (or concurrently) be developed as the technical reflection of those FFDs.

Common Operational Picture (COP) The COP in FBE-Kilo did not have explicit "ownership" by any initiative, and was not maintained to a level required to support ISR and JFN in support of TST.

Recommendation: Early in the FBE planning stages, identify who has responsibility for each of the many complex, interdependent functions that go into producing an accurate, stable COP from which players will be capable of "fighting the experiment". Consider doing the same with other "foundational" FBE processes, depending on the nature of the experiment.

6.8 EXPERIMENT EXECUTION LESSONS LEARNED

IKA Support There was no coordinated IKA support for FBE-Kilo execution. No IKA lead planning or execution support was responsible for many delays and training problems. Ad-Hoc, initiative-level, IKA measures were implemented on the fly to support execution. No clear level of IKA support was ever articulated to the planners during the planning process.

Recommendation: Identify IKA (or other initiative area) participation level in FBE and ensure that it is maintained.

Fleet Execution Support Fleet staff support was inadequate for the Sea Strike Initiatives. The promised JFACC support was also minimal and not what had been planned. This lack of support was a significant factor in not realizing the experimental potential of the Sea Strike efforts in FBE-Kilo.

Recommendation: Insure the proper level of Fleet staff support for an experiment will be available by frequent interaction with the uniformed staff at the ACOS level.

Scenario The FTX scenario did not match (very closely), the FBE Sea Strike live force scenario. This was due to the CJTF (C7F) fighting the simulation and live scenarios together when they were designed to be separate.

Recommendation: Force a higher level of fleet experiment/exercise integration familiarization early and often in the planning process.

6.9 EXPERIMENT TECHNOLOGY LESSONS LEARNED

There is some duplication here with material presented above for Fires Initiative conclusions. It is felt that duplication is preferable to having the reader possibly miss important points by not examining both sections.

Shipboard System Specifications USS Blue Ridge has a 10 mb switch backbone that is connected via 155 mb links. This, along with inconsistent network card setting hindered ADOCS use during the FBE. Standard, shipboard LAN configurations that support ADOCS need to be established. This applies to switch, link, and network card settings on these machines. Hardware limitations may require platforms to set up multi-server configurations to reduce the effect of less modern network backbones.

Recommendation: Set ISNS ADOCS standards prior to install and configure accordingly.

ADOCS Recommend Software / Hardware Changes Many recommended changes to ADOCS were compiled during the FBE. ADOCS changes are indicative of command and control capability requirements that currently exist.

Recommendations:

Software

1. Ability to pair a target to an ITO mission via a button
2. Ability to highlight targets in Fires and JTST Managers when changes have occurred…alert?
3. A configurable Fires Manager (within the ADOCS GUI).
4. Add "hour glass" icon to ADOCS to display system working.
5. TST supported CDR indicator in JTST Managers.
6. Hot link to ROE url.
7. Hot link to TST priorities url.
8. Creation of a Combat Assessment Manager and removal of that function from the Fires/JTST managers.
9. Hot link to target folder url.

Hardware

1. Two (2) displays for ADOCS users that are doing target development and coordination

JFN interaction with ADOCS ATI.ATR target nomination to JFN was incomplete and not viable for usage. This problem needs to be fixed. It was identified over 2 years ago and is still a problem.

Recommendation: Perform detailed ADOCS–JFN testing to fix this problem. This should be completed in the lab rather than waiting for another experiment.

Tactical Exploitation System – Navy FBE-Kilo reconfirmed that TES-N has a number of powerful tools (some of which are unique to TES-N) that potentially could be of great use to Naval forces involved in TST. It also reconfirmed that TES-N remains a developmentally immature system, with extremely limited interfaces to other C4I systems that are critical to TST, in particular GCCS-M and ADOCS.

Recommendation: Don't use TES-N in any further TST-related experimentation until

major advances are made to at least the following:

- Interface with ADOCS
- Interface with GCCS-M
- Interface to PTW and any external target folder applications (e.g., attachment of image chips to ATI.ATR messages)
- Handling of ISR video and platform/sensor telemetry
- SCI COMINT analysis tools, and SCI-to-GENSER connectivity via ISSE Guard.

ELINT / ESM ELINT/ESM was sent from various M&S sources to the TDDS Network Management Center, to be put onto the TDDS broadcast, with receipt of the broadcast on BLR via organic means, and processing of exercise/experiment ELINT using the GALE software in TES-N.

- Successful receipt was achieved
- TES-N GALE was unable to receive, process, and display TACELINT messages from ISR UUV that reported an LOB.

COMINT COMINT injects were to be crafted by Kunia Regional SIGINT Operations Center (KRSOC) scripters who were resident in the TT03 JECG at Camp Smith, HI. Injects would be sent via SI broadcast to BLR and received by a COMINT analyst using TES-N.

- COMINT injects were received only on SCI GCCS-M, as that is the way the BLR SCI architecture was configured.
- The COMINT analyst at the SCI GCCS-M received the injects as emails, printed them, and sneaker-netted them to the TST team manning TES-N terminals.
- TES-N does not have any true COMINT analysis tools (as does SCI GCCS-M).
- TES-N Information Support Server Environment Guard was non-functional on BLR.

Target nomination messages (ATI.ATRs) to ADOCS and to TST Target Folder Server The objective was for the TST nomination analyst to use TES-N to create a target nomination message (in USMTF "ATI.ATR" format), and to send that nomination message (via SMTP) to the ADOCS server on BLR, and to the TST Target Folder server at NWDC. Considerable effort was required to get all systems interoperating correctly, TES-N LAN, ship's LAN/Exchange server, FBE-K WAN and Exchange servers, ADOCS mail server. Once set up properly the process worked well.

Target identification difficulties Inconsistencies existed in how target nominations were handled by ADOCS and how they were showing up in the TST Target Folder server. The fault was in both TES-N and ADOCS, with inconsistencies in target line usage. ADOCS turned around an ATI.ATR with fields out of order and truncated.

Images related to target nominations to PTW for aim-point refinement The objective was to attach images (e.g., video "chips" showing the TST) to the outgoing target nomination, and send the nomination simultaneously to ADOCS, TST Target Folder, PTW.

- The version of PTW used on BLR could not receive and parse ATI.ATR messages (i.e.,

did not have the DTMS software used in MC02/FBE-J).
- TES-N does not allow images to be attached to outgoing ATI.ATRs.
- All images captured, chipped, and saved (as NITF) in TES-N had to be manually transferred (FTP) to PTW.
- The PTW operator would pull up the images and conduct aimpoint refinement, then save the images (as both JPEG and NITF) to a shared directory on the BLR IT-21 LAN.

Images related to target nominations to TST Target Folder Server The objective was for the TST nomination analyst to attach images to the outgoing target nomination so that the TST Target Folder server could add the image(s) to the TST's target folder.
- TST Target Folder server worked well and the NWDC TST Target Folder server application proved to be a simple but powerful prototype.
- The new version 5.0 of TES-N software still cannot attach images to ATI.ATRs.

File transfer to ISRM (CPX) and ESSEX RTC / RTC Lites (FTX) Because "DIOP" is only for the transfer of U-2 imagery that is being (or has just been) directly downlinked, other file types must be exchanged between TES-N and remotes like ISRM and RTCs using standard means such as FTP and SMTP.
- FTP and SMTP worked well.
- RTC Lites worked, with varying difficulty. RTC Lite at NUWC was fairly easy to get up, configuring the others was difficult.

Cross-INT replication from TES-N to ISRM (CPX) and ESSEX RTC (FTX) Replication of TES-N's Cross-INT database was attempted to both ISRM (CPX) and the ESX RTC (FTX), but with very limited success.
- During CPX, Cross-INT was not replicated to ISRM due to ISRM instability problems.
- During FTX, Cross-INT was replicated to ESX RTC.
- Target Nominations created in TES-N are not replicated to ISRM / RTC.

6.10 EXPERIMENT COP ISSUES

M&S simulated ISR asset display in GCCS-M COP By the end of FTX, all of the simulated Blue ISR assets active in M&S were simultaneously displayed on BLR's GCCS-M COP with appropriate labels (e.g., two ISR UUVs, two Predator UAVs, one U-2). This was the first time that this has happened in an FBE.

TST location output to COP (i.e., Manual Contact to GCCS-M) for "tracking" and SA): The objective was for the TST nomination analyst to not only create an ATI.ATR as above, but to then use TES-N's rudimentary interface to GCCS-M to input the target into the COP as a track, for the situational awareness of ALCON, and to assist (theoretically) in the "tracking" of the TST while waiting for it to be engaged.
- The TES-N output to GCCS-M only worked for two days at the same rudimentary and suboptimal level at which it was working for MC02/FBE-J; for the remainder of

TT03/FBE-K it was functionally inoperative.

- Even with the new TES-N version 5.0, there was no improvement in TES-N's ability to output to GCCS-M from what was used in MC02/FBE-J.

GCCS-M COP Tracks into TES-N ITD In addition to TES-N's rudimentary capability to send "Manual Contacts" to GCCS-M, COP tracks can also be sent from GCCS-M to TES-N. The objective of attempting to do so was to provide a richer context of contacts, tracks, Blue ISR asset locations, etc., in TES-N for the analysts trying to find and fix TSTs.

- TES-N's incoming "Message and Data Log" showed a good number of incoming tracks from GCCS-M, but those tracks did not appear to be parsing into the TES-N ITD.
- When GCCS-M tracks coming into TES-N were able to be brought up on the ITD it did not display any track labels.
    - GCCS-M tracks in TES-N's ITD appeared in their proper locations but the symbols do not have any labels associated with them (e.g., no track names), making them all but functionally useless to the TST team.

6.11 ORGANIZATION CONCLUSIONS

Time Critical Targeting Functionality Afloat The Xray Papa cell was an excellent test case for familiarization of the TCTF concept to the fleet. TCTF is a USAF program that outlines the C2 requirements and systems for conducting TCT operations. In support of JCC and JCC (Afloat), the USN needs to further refine this concept to support both joint and maritime forces from a flag configured platform.

Recommendation: Use TCTF Afloat a starting point for future Sea Strike initiatives.

Xray Papa and Maritime Component Time Sensitive Targeting The Xray Papa cell identified a time sensitive targeting gap at the maritime component level that needs to be addressed. JFMCC's conduct of broad scale TST operations that are integrated with other components is beyond the traditional role of the Bravo Papa. A staff function at the operational level (JFMCC) that supports TST prosecution is required.

Recommendation: Integrate this effort with the TCTF effort described above to help identify maritime TST command and control requirements of the future.

6.12 FBE DATA LESSONS LEARNED

There have always been problems in FBEs with obtaining all of the data needed from the various hardware systems to form complete Fires timelines. This was not improved for FBE-Kilo.

Referring to Table 4.1, we see that only 9 of the required 24 data elements were obtained. We repeat the data overview statement from Section 5.3.1:

Compared to other recent FBEs the objective data provided for this experiment was deficient in quantity and quality. In particular:

- The provided TES-N covered only a few days of the CPX and was reformatted so as to

be unusable.

- No GISRC data were provided.
- The ADOCS JTST manager did not set capture mission histories for the last two days of the experiment
- After acquiring excellent mensuration data from RRF in FBE-J, FBE-K reverted to PTW which has never provided usable data.
- The JSAF event data logged in SNN did not include Fire events. There were gaps in the JSAF event data and/or many fire commands did not reach JSAF.

There continues to be a problem with Fires systems not being time synchronized.

Ironically, even though the data situation was worse in Kilo, the impact was not as large as it has been for other experiments. This is because former experiment results depended strongly on being able to develop valid, quantitative, TST timelines. Here we have been interested in broader issues such as CONOPS and how JFN contributes to TST processes. Even so, degradation in the ability to obtain needed electronic data does not bode well for future experimentation.

Recommendation: Develop a program to insure needed electronic data is made available from all systems that are part of the TST process, including simulations.

The following are implementation measures for the recommended program. In future experimentation the application of these measures would do much to improve the collection of objective data:

a. Require for system participation in an experiment that the system incorporate tools that would log, identify and timestamp all significant operator actions.

b. Require data logging in formats that can be easily manipulated for post experiment analysis.

c. Include as an objective in pre-experiment integration testing the validation of the data logging applications.

Appendix A ADOCS TST PROCEDURES CHAT

This Appendix contains an extensive discussion collected from the AIR_OPS IRC channel on April 30 that illustrates the participant confusion regarding ADOCS TST procedures that persisted even in the closing days of the experiment.

The nomination discussed, GE0157, was a tracked vehicle target nominated by the E-2C GISRC and was received in ADOCS at 300137Z The target was paired to TACAIR mission 1023. The target was not engaged.

[02:58] <XP_E2X> MSN GE0157
[02:59] <E2C-5> MSN 0157
[03:00] <XP_E2X> take a look at it in ADOCS
[03:00] <E2C-5> looking at it
[03:01] <E2C-5> we nominated it about an hour and a half ago
[03:01] <XP_E2X> acknowledge
[03:01] <E2C-5> is there something you want to know about it?
[03:01] <XP_E2X> understand the process takes a while
[03:01] <E2C-5> what process/
[03:01] <E2C-5> ?
[03:02] <XP_E2X> ADOCS TST process
[03:03] <E2C-5> ADOCS is almost immediate
[03:03] <XP_E2X> have you acknowledged in ADOCS
[03:03] <E2C-5> acknowledged what? we nominated it
[03:04] <XP_E2X> yes but it has to be assigned/WTP etc you don't own it until XP tells you do
[03:04] <E2C-5> ok, so.... ARE you TELLING me to WTP it?
[03:04] <E2C-5> I can DO that
[03:05] <XP_E2X> it already has been but if you have a closer or better asset then make the recommendation to XP
[03:07] <E2C-5> I don't know what we're waiting for. The tactical picture changes in the period of an hour and a half. WTP is only good for so long.
[03:07] <E2C-5> I can change the WTP when you want to fire. If I WTP and then an hour and a half goes past, then I might not even have the same assets in the air.
[03:09] <E2C-5> If you don't want to kill the target, there's literally no point in doing WTP.
[03:11] <E2C-5> Standing by for tasking...
[03:16] <E2C-5> where are we in the process at this point. Is there anything we can do to help the process along?
[03:22] <XP_E2X> if we don't assign it as TST we wait to make a decision if we want to attack or not or wait until tomorrow's ATO
[03:23] <XP_E2X> in the mean time you can change your box for msn GE0157 blue=ack
[03:24] <XP_E2X> YYYYEEEESSSS
[03:24] <E2C-5> ok, what does acknowledge mean?
[03:24] <E2C-5> what am I acknowledging?
[03:25] <XP_E2X> that you understand that the msn is being assigned to you and assets under your control if we should decide to attack it

[03:25] <E2C-5> do we have to WTP in order to desig as a TST? I would think that TST decision would be independent of the weapon used to execute.
[03:26] <XP_E2X> after we both go blue=ack then ADC will go red until the TST or deconfliction is complete
[03:26] <E2C-5> how do I know that I should go blue?
[03:26] <XP_E2X> do you have JMEMS airborne
[03:27] <E2C-5> no
[03:27] <XP_E2X> blue=ack do you have the color box matrix we forwarded
[03:27] <E2C-5> we have the matrix
[03:28] <XP_E2X> then read along
[03:29] <E2C-5> when we are assigned a mission, we assume that the decision to execute has been made.
[03:29] <XP_E2X> not until the boxes are turned the correct colors
[03:29] <XP_E2X> by ALL PLAYERS involved in the process
[03:30] <E2C-5> ok, so you need to tell me that I should expect to be tasked with a mission, then that I will be tasked with a mission, then that I should execute the mission. Is that correct?
[03:30] <XP_E2X> it hasn't been nom'ed as a TST so XP is making a determination if they care to attack it or not
[03:30] <XP_E2X> correct
[03:31] <XP_E2X> unless tasked directly from the JFACC
[03:31] <E2C-5> ok, would it be possible for you to just tell me when you want to execute a target?
[03:32] <E2C-5> or are we strapped to these rules?
[03:33] <XP_E2X> check the box in ADOCS I will turn XPA green=ready to engage then you turn your box green
[03:33] <XP_E2X> I will also pimp you via chat
[03:33] <E2C-5> ok
[03:34] <XP_E2X> this is the process using ADOCS...and that is what we are sitting out here trying to do
[03:34] <XP_E2X> what did you think we were doing
[03:35] <XP_E2X> wow it only took a week to achieve this level of understanding
[03:35] <E2C-5> I guess with this process I can understand why it takes so long.
[03:37] <E2C-5> again, I refer you to the fact that by the time all this happens, we might have lost the assets we were planning on executing with, and cause us to go back to the beginning with the new WTP.
[03:37] <E2C-5> Cycle time on a Hornet is not in excess of 1.5 hours, he very well might be on tanker when the decision comes through
[03:39] <E2C-5> The optimal air asset to execute a target changes in a period of 15 minutes. We'll play by the experimental rules, but want to make sure all are aware of the issues involved in this process to real world ops.
[03:39] <E2C-5> so now I'm waiting for your box to go green right?
[03:42] <XP_E2X> understand..that's why if the asset need to be updated you need to pass that along to XP and go into ADOCS saying you can't execute..go to chat explain the what the plan is will be hammered out.
[03:42] <E2C-5> also be advised if you're looking to execute on this target, we're going to need

to update the WTP for this target, the original asset has RTB'd
[03:43] <E2C-5> we can still execute, just with a different asset
[03:43] <XP_E2X> don't think TST as within the next 5 mins...for now
[03:44] <XP_E2X> noted on asset update
[03:47] <XP_E2X> be advised the people in the JIC/JFACC/JCMCC/XP/BLR/& the Fleet have never seen or ever worked with these systems before..and identifying this process is what we are here for...remember who the customer is is not the guys in Newport with there joystick in there hands but 7th fleet

[03:48] <E2C-5> I recognize that. I'm trying to help you guys. I'm just trying to point out where the system is going to break in the real world
[03:48] <E2C-5> right now I can't pair anything in LAWS
[03:49] <E2C-5> I've already changed the time to allow for targeting, as it had turned red
[03:49] <E2C-5> the NLT I mean
[03:49] <E2C-5> now LAWS is saying that all my assets will have no effect on the target.
[03:49] <E2C-5> we're going to re-start ADOCS
[03:49] <E2C-5> standby
[03:51] <XP_E2X> I knew that when we started but again this is there first introduction to ADOCS... no Subject matter experts just a bunch of guys trying to figure out what these box do
[03:52] <XP_E2X> I changed your box white until we develop things better here
[03:52] <E2C-5> just don't want it figured out in a way that won't work

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Appendix B SPECIFIC TARGET TIMELINE AND INFORMATION

This Appendix contains information for five targets. There are Annexes, each containing a timeline for a selected TST engagement. Following the timestamp for each entry in the timeline is the source of the information. This will be a system (e.g. ADOCS) or an IRC chat channel. In the case of the ADOCS Mission History, the agent for the change is identified. For IRC, the specific chat channel is cited followed by the name of the node initiating the communication. If the channel was in the Coalition's IRC net the name of the channel is followed by "(Coalition channel)".

All times are GMT.

Annex	Target #	Engagement
B1	TB0050	TES-N nominated SA-15 engaged by DDX LRLAP
B2	TB0051	TES-N nominated SCUD, WTP to TACAIR but not engaged
B3	AB5027	BLR nominated vehicle. convoy engaged by ANZAC with ERGM
B4	GX0321	DDX nominated field artillery engaged by ANZAC with ALAM
B5	AA0368	ANZAC nominated cruise missile site engaged by DDX with TLAM

Annex B1 - Nomination TB0050

1.Timelime

TB0050 was an April 30 nomination of an SA-15 target by TES-N. The target was prosecuted by the DD-X with 8 LRLAP rounds. Table B1.1 shows the critical timeline events. All actions and IRC communications related to the TB0050 engagement are listed in Section 4.

Table B1.1 TB0050 Timeline

Event	Time
Nomination received in ADOCS	00:13
XP acknowledges mission	00:23
Begin strike planning (TCT =yellow)	Not done
Target confirmed TST	Not done
Nomination promoted to JTST	00:23
JOCC WTP to DDX	00:29
ADC initiates deconfliction	00:34
DDX assigned mission	00:34
DDX acknowledges mission assignment	00:37
NLT time	02:13
Target is deconflicted	03:28
XP authorizes engagement	03:28
DDX accepts mission	03:28
DDX fire when ready	03:43
LRLAP Fired	03:57

The interval between the receipt of the mission and the fire event was three hours and 44 minutes**.** This mission is considered a failure since it was not fired until 200 minutes after the NLT time. This failure was due to a large unexplained interval between the DDX acknowledging the mission (00:37) and the appearance in ADOCS of various mission approvals (03:28)

LRLAP is a precision weapon that normally would require a precise target position. Target mensuration was not discussed regarding this mission and a mensurated position does not appear in the ADOCS tabs. The salvo of eight rounds may have been considered to override the requirement for a precise target position.

2.TTP
The ADOCS actions in this engagement are compared to the ADOCS TST TTP outlined in Table 7 and Table 8.

The ADOCS TTP (Table 8) indicates that the TCT block should be used (turned yellow) to initiate strike planning for a TST. It was not so used in this engagement. The JIC turned the TCT block blue (at 00:31). This an undefined color choice in the ADOCS TTP and hence meaningless.

The BLR turned the DDX block to back to yellow (01:05) after the shooter had changed it to blue. This action is undefined and unexplained.

The JIC Air IPB set the ADC block to red (00:54) but the BLR SPARE 4 set it to green (03:15) indicating deconfliction was completed. The latter workstation also simultaneously set the DDX

(this is a DDX responsibility) and XPA blocks to green. This appears as an unrealistic action performed after more than an hour of no action in order to force the engagement to a conclusion.

At 3:52 the DDX requests permission to engage. XP says the display is all green and instructs him to fire. If the DDX display was all green he should not have wasted time in seeking permission to fire. If his display was not all green due to ADOCS latencies then he had to resort to chat to get fire permission. In either case, the potential for ADOCS as a tool to expedite the TST engagement process is not being realized.

3.ADOCS

ADOCS is the primary tool and data source in the engagement of TSTs. Failures or inconsistencies in ADOCS have an important impact on the engagement process and experiment analysis. Some of the problems encountered in this mission are listed below

The time the nomination was received in ADOCS as indicated in the mission history (00:13) and in the fire mission targeting tab (00:59) are inconsistent. The latter time is incompatible with the IRC data therefore the former time is adopted.

The JTST Mission History was very incomplete. Only a single event was recorded

There appears to be a time problem between the IRC times and the ADOCS times. For example, in IRC it is reported the mission was fired at 3:57, but the FRD block turned green in ADOCS at 3:45. It is known that the IRC chat times were accurate to within two or three minutes.

There are sometimes substantial latencies in the receipt of color block changes by all workstations. Some examples:

a. at 3:27 XP_DDX states the TB0050 mission is all green. At 3:30 TAO_DDX reports that on his display XPA is yellow and ADC is red.

b. At 0:50 DDX turns the DDX blue to acknowledge the mission, at 1:05 BLR turns the block yellow, at 1:24 DDX turns it back to blue. At 1:50 XP_DDX requests DDX acknowledge the mission. At 1:54 XP_DDX tells DDX the box should go blue. At 1:58 TAO_DDX responds that his DDX box is blue. Apparently XP_DDX does not hold on his ADOCS display the acknowledgment (blue DDX block) made by DDX 30 minutes ago

c. This problem is also illustrated by Table B1.2 Which shows the final state of the ADOCS Fires display from: the Mission Coordination: Fires Mission History, the BLR Mission Coordination: Fires display and the Newport Mission Coordination: Fires display. The BLR display shows the WRD and FRD blocks white rather than green.

Table B1.2. Final Mission state from Different ADOCS sources

Source	TCT	XPA	E2X	DDX	ANZ	ADC	WRD	FRD	BDA
Mission History		G		G		G	G	G	
Mission Coordination: Fires display BLR		G		G		G			
Mission Coordination: Fires display Newport		G		G		G	G	G	

The Fires Mission History exhibits a number of inconsistent coordination block changes that may be attributable to ADOCS latency. An example:

At 2:03 the DDX server ADOCS workstation turns the DDX block from blue to green. At 2:05 the DDX Shooter 1 ADOCS workstation turns the DDX block from blue to green. The block should have already green. At 3:28 BLR turns the DDX block from yellow to green, but the block was already green and was last yellow at 1:24. An interpretation of these, and other similar anomalies, is that the earlier changes to the DDX had not arrived at the workstation making the change and so it made the change based on the color of the block it displayed.

In the JTST display the MSN block status is yellow EXE indicating the mission was not fired.

4.Timeline actions and events.
Listed below in time tagged order are all significant IRC channel communications and ADOCS actions obtained from the ADOCS Mission History logs that relate to TB0050.

00:13 ADOCS Fires Mission History. Time the nomination was received in ADOCS from TES-N.
00:20 ADOCS Fires Mission History. JIC RFI ASST refines target type as SA-15 and modifies the target Not Later Than (NLT) Time.
00:23 ADOCS Fires Mission History / JTST target data tab. The nomination is promoted to JTST.
00:23. ADOCS Fires Mission History. JOCC turns XPA block yellow indicating XP acknowledges the mission.
[00:28] IRC. MARITIME_OPS <TAO_vDDX> XP. received TCT for TB0050, hold DDX Coord box as white.
00:29. ADOCS Fires Mission History. JOCC WTP the target to DDX and LRLAP.
00:31. ADOCS Fires Mission History. JIC Air IPB turns TCT block blue**.**
00:37 ADOCS Fires Mission History. DDX sets mission volley size to 8.
00:47 ADOCS Fires Mission History. JIC Air IPB turns ADC block red indicating the mission is being deconflicted.
00:47 ADOCS Fires Mission History. JIC Air IPB turns DDX block to yellow. Indicating the mission is assigned to DDX.

00:50 ADOCS Fires Mission History. DDX turns the DDX block yellow to blue indicating he acknowledges the mission assigned to him.
01:05 ADOCS Fires Mission History. BLR turns DDX block from white to yellow.
01:24 ADOCS Fires Mission History. DDX turns the DDX block from yellow back to blue.
[01:38] IRC. MARITIME_OPS. <TAO_vDDX> XP... req WTP TB0050 for LRLAP mission.
[01:45] IRC. MARITIME_OPS. <XP_DDX> DDX RGR wait one
[01:50] IRC. MARITIME_OPS. <XP_DDX> DDx TAO pls ack receipt of tgt TB0050 on ADOCS
[01:54] IRC. MARITIME_OPS. <TAO_vDDX> DDX shows ADC holding TB0050 red.
[01:54] IRC. MARITIME_OPS. <XP_DDX> rgr DDx box should go blue
[01:56] IRC. MARITIME_OPS. <TAO_vDDX> rgr blue
[01:58] IRC. MARITIME_OPS. <TAO_vDDX> DDX shows our box blue
02:03 – 02:16 ADOCS Fires Mission History. DDX made multiple changes to the DDX block with the block starting and ending blue.
02:13. ADOCS. NLT time
[03:27] IRC. MARITIME_OPS. <XP_DDX> DDx-TAO TB0050 is all"green" engage tgt. Please confirm though what you show
03:28 ADOCS Fires Mission History. BLR (spare 4) turns ADC block green indicating the mission is deconflicted
03:28. ADOCS Fires Mission History. BLR (spare 4) turns XPA block green meaning the shooter is cleared to engage.
03:28. ADOCS Fires Mission History. BLR (spare 4) turns DDX block
[03:30] IRC. MARITIME_OPS. <TAO_vDDX> XP... We show XPA as yellow; DDX as green; ADC still red.
[03:30] IRC. MARITIME_OPS. <XP_DDX> TAO DDx confirm u r in positive control of UAV2
[03:31] IRC. MARITIME_OPS. <XP_DDX> rgr ddx.
[03:31] IRC. MARITIME_OPS. <TAO_vDDX> DDX has pos control of UAV2
[03:31] IRC. MARITIME_OPS. <XP_DDX> u r authorized to engaged vis this chat.
[03:38] IRC. MARITIME_OPS. <TAO_vDDX> XP... having probs with NFCS. Req WTP TB0050 with TLAM.
03:43 ADOCS Fires Mission History. DDX turns fire when ready block green.
[03:50] IRC. MARITIME_OPS. <TAO_vDDX> XP... DDX can now execute TB0050 with LRLAP.
[03:52] IRC. MARITIME_OPS. <TAO_vDDX> XP... NFCS is down but ADOCs is up. We'll use ADOCs for LRLAP msns.
[03:52] IRC. MARITIME_OPS. <TAO_vDDX> XP.. Req permission to engage TB0050 with LRLAPs.
[03:53] IRC. MARITIME_OPS. <XP_DDX> I show all green for permission. Engage TB0050
[03:55] IRC. MARITIME_OPS. <TAO_vDDX> XP... DDX engaging TB0050 with 8 LRLAP rnds.
[03:56] IRC. MARITIME_OPS. <TAO_vDDX> XP.. LRLAP rnds away at 0357
03:58 ADOCS Fires Mission History. DDX turns FRD block green. Mission fired.

Annex B2 - Nomination TB0051

1. Timeline TB0051

This was an April 30 TES-N nomination of a SCUD target. The mission was assigned to TACAIR but not executed**.** Table B1.1 shows the critical timeline events. All actions and IRC communications related to the TB0051 engagement are listed in Section 4.

Table B2.1 TB0051 Timeline

Event	Time
Nomination received in ADOCS	00:41
JIC refines target type and NLT	00:43
Nomination promoted to JTST	00:44
XP acknowledges mission	00:44
Deconfliction initiated	Not done
Deconfliction complete	01:16
WTP ATO mission Hornet21	01:22
Mission assigned to E2-C	01:27
target type refined	01:38
WTP ATO mission LOITER07	01:56
NLT time	02:41
WTP ATO mission HORNET65	03:43
E-2C ack assignment	Not done
E-2C accepts mission	Not done
XP ack mission acceptance	Not done
XP authorizes mission	Not done

At various times, the target was assigned to three different ATO missions and at different times a U-2 and a Predator were on station to obtain BDA. But it appears from ADOCS and IRC that the target was ever engaged. From IRC, it is clear that the E2C did not see the mission in his ADOCS. It did appear in the ADOCS viewed by the TST_LNO. Since the E2 does not hold and could not act on the mission, TST_LNO arbitrarily assigned a TOT time.

E-2C never acknowledged assignment of the mission to him because the mission did not appear in his ADOCS. XP never went green to authorize mission engagement.

The original experiment plan was to enter georefinement results into the ETF. It was requested for this mission (1:09) that georefinement results be entered in the JTST Target Data tab. There is no indication there or elsewhere that target georefinement was ever performed.

The IRC contains several example of particular nodes having to type the same message in multiple chat channels. This inefficiency should be mitigated by a more careful assigning of functions and participants to particular channels.

2. TTP

At 1:16 the JAOC SIDO turned the ADC block from white to green indicating deconfliction was

complete. The block was never turned red as required to indicate deconfliction was underway. Further, the deconfliction was complete before the mission was formally WTP to Hornet21 although that pairing was discussed in IRC before it was implemented. However, the target was subsequently WTP to two other ATO missions. Presumably the deconfliction result would not apply to these subsequent missions

At 1:26 JAOC TGTS simultaneously changed the JTF, SOF, LCC and MCC blocks green I the JTST display. This appears as a pro forma action without any operational significance.

3. ADOCS
The E-2C ADOCS never received the mission

The information about the mission is not consistent between the Fires and JTST histories. For example the JTST History shows the JAOC TGTS first paired the target with ATO call sign Hornet 21 at 1:22. Both histories show the target paired with ATO call signs LOITER07 and HORNET65 at 1:56 and 3:43 respectively. The JTST shows the target type was refined from SCUD D to SCUD D camouflaged at 1:38. This change does not appear in the Fires History. For the JFMCC/XP ADOCS fires is the primary tool for prosecution of TSTs. JTST is a collaboration tool to provide Situational awareness to all Components of the status of TSTs. They should contain the same information and changes in one Manager should automatically update the other

The color changes to the TCT block recorded in Fires Mission History are not internally consistent and not consistent with the ADOCS Fires displays. The changes reported in the Mission History are shown in Table B2.2.

Table B2.2 Color changes to the TCT Block

Agent	Time	Color Change
JAOC SIDO	1:16	yellow to green
JAOC TGTS	1:27	white to green
JAOC TGTS	1:29	green to yellow

The first change at 1:16 should have started with white, the second change at 1:27 should have started with the existing state (green). The final state of both the BLR and Newport ADOCS displays show the state of the TCT block as green rather than yellow (see Table B2.3). These inconsistencies may be, at least in part, a result of ADOCS latencies but some could be attributable to events not logged in the mission history.

Table B2.3. Final Mission state from Different ADOCS sources

Source	TCT	XPA	E2X	DDX	ANZ	ADC	WRD	FRD	BDA
Mission History	Y	Y	Y			G			
Mission Coordination: Fires display BLR	G	Y	Y			G			
Mission Coordination: Fires display Newport	G	Y	Y			G			

4. Timeline Actions and Events

00:41 ADOCS Fires Mission History. Nomination received in ADOCS from TES-N
00:43 ADOCS Fires Mission History. JIC RFI ASST refines target type to SCUD D and modifies the NLT time.
00:44 ADOCS Fires Mission History. Nomination promoted to JTST**.**
00:44 ADOCS Fires Mission History. BLR sets XPA to yellow indicating the mission is acknowledged and being worked.
[00:50] IRC. JTF_TST_COORD <TST_LNO> JFMCC/XP - zoom in on ADOCS once FIND on MAP. TB0051 plots on FDM!
[00:52] IRC. JTF_TST_COORD <TST_LNO> XP/JFMCC - pls work best TOT for Hornet21 IOT engage TB0051 and for BDA gameplan
[00:53] IRC. JTF_ISR_COORD <TST> WRT: TB0051 we need collection for PID
[00:57] IRC. JTF_ISR_COORD <TST> WRT: TB0051 what was the source of INTEL on this?
[00:58] IRC. JTF_ISR_COORD <TGT_OFF> TST_LNO - the imagery of the CAMOFLOUGED Scud is in the ETF
[00:58] IRC. JTF_TST_COORD <TST_LNO> XP/JFMCC: PLS work a best TOT for Hornet21 IOT eventually engage TB0051 and to coord BDA w/ U2. TCT block in Fires Mgr is YELLOW. NOT cleared yet to engage!
[01:07] IRC. JTF_ISR_COORD <TST_LNO> E2C-5: Looking for TOT for Hornet21 IOT engage TB0051 and to work BDA coord. Pls pass via chat.
[01:08] IRC. AIR_OPS <E2C-5> looking for TOT for Hornet21 to engage TB0051
[01:09] IRC. AIR_OPS <E2C-5> Tacair you there?
[01:09] IRC. JTF_ISR_COORD <E2C-5> attempting to establish comms with TACAIR
[01:09] IRC. JTF_TST_COORD <TST_LNO> JIC: Any chance of getting geo-refinement on TB0051? If so pls enter in Tgt Data tab (JTST Mgr)
[01:12] IRC. JTF_TST_COORD <TST_LNO> ALCON: Couldn't wait. Set TOT for TB0051 of 0135Z
[01:12] IRC. AIR_OPS <XP_E2X> hold up on that who gave you tasking for TB0051
[01:13] IRC. AIR_OPS <E2C-5> TST_LNO
[01:13] IRC. AIR_OPS <E2C-5> I don't have TB0051 in LAWS anyway
[01:13] IRC. JTF_ISR_COORD <E2C-5> I don't show TB0051 in LAWS
[01:13] IRC. JTF_ISR_COORD <TST_LNO> E2C-5 it's in both Fires Mgr and JTST Mgr. Couldn't wait. Set notional TOT for Hornet21 of 0135Z
[01:14] IRC. JTF_ISR_COORD <E2C-5> TACAIR is having computer problems
[01:14] IRC. JTF_ISR_COORD <E2C-5> we are waiting for them to fix their issues and get aircraft launched for this event

[01:15] IRC. JTF_ISR_COORD <TST> WRT: TB0051 we'll be requesting post-strike BDA on target w/in 30 minutes of TOT which is 0135Z.
[01:16] IRC. JTF_ISR_COORD <E2C-5> are you planning on hitting with with other assets?
[01:16] IRC. JTF_ISR_COORD <E2C-5> have you coordinated with XP?
[01:16] IRC. JTF_ISR_COORD <JFN_J2_OP> copy BDA on TB0051
[01:16] IRC. JTF_ISR_COORD <E2C-5> I don't have TACIAR to task at the moment
1:05 ADOCS JTST Collection Request tab. U2 tasked to remain on station for BDA
1:16 ADOCS Fires Mission History. JAOC SIDO changes ADC to green indicating deconfliction complete.
1:16 ADOCS Fires Mission History. JAOC SIDO changes TCT block to green indicating the target is a confirmed TST.
1:16 ADOCS Fires Mission History. JAOC SIDO changes the E2X block to yellow indicating mission assignment.
1:22 ADOCS JTST Mission History. JAOC TGTS pairs mission with ATO call sign HORNET21.
1:26 ADOCS JTST Mission History. JAOC TGTS simultaneously changed the JTF, SOF, LCC and MCC blocks green.
1:38 ADOCS JTST Mission History. JAOC TGTS refines target type to SCUD D camouflaged.
[01:43] IRC. JTF_ISR_COORD <E2C-5> looks like we have TACAIR under our control and are standing by for tasking
[01:53] IRC. JTF_ISR_COORD <JFN_J2_OP> ISR reports no strike in area. TEL reported as packing up and preparing to depart. ETD is 10 minutes. UAV1 to RTB f
[01:54] IRC. JTF_ISR_COORD <JFN_J2_OP> UAV1 RTBing to EOM
[01:54] IRC. JTF_ISR_COORD <E2C-5> so we're going to let him pack up and move?
[01:55] IRC. JTF_ISR_COORD <JFN_J2_OP> unless you can roll something in 10 minutes. was there ever a MISREP from LOITER07?
[01:55] IRC. JTF_ISR_COORD <E2C-5> is the target in LAWS?
[01:56] IRC. JTF_ISR_COORD <JFN_J2_OP> target is in ADOCS
[01:56] IRC. JTF_ISR_COORD <E2C-5> ok, what is the target number
[01:56] IRC. JTF_ISR_COORD <JFN_J2_OP> TB0051
[01:56] IRC. JTF_ISR_COORD <E2C-5> don't show that in my target list
[01:57] IRC. JTF_ISR_COORD <E2C-5> if you pass location I could investigate options, but that would be outside of LAWS

1:43 ADOCS Fires Mission History. JAOC TGTS pairs mission with ATO call sign LOITER07.

2:00 ADOCS JTST Target data tab. Predator on station 1:05 to 1:50 and did not see any detonation in vicinity of target. Reported target was preparing to depart site at 1:45. Predator returning to base.

02:41. NLT time.

3:30 ADOCS Fires Mission History. JAOC TGTS pairs mission with ATO call sign HORNET65

Annex B3 - Nomination AB5027

1. Timeline

This was a vehicle convoy nominated by the Blue Ridge ADOCS on April 29 GMT (April 30 experiment day). The target was engaged by the vANZAC with four ERGM.

Table B3.1 AB5027 Timeline

Event	Time
Nomination received in ADOCS	23:42
WTP to ANZAC and ERGM	23:47
Begin strike planning (TCT =yellow)	Not done
Target confirmed TST	Not done
Deconfliction initiated	Not done
Deconfliction complete	Not done
ANZAC assigned mission	23:47 (1)
XP acknowledges mission	00:29 (1)
ANZAC acknowledges mission assignment	01:07 (2)
ANZAC accepts mission	01:13 (3)
XP acknowledges mission acceptance	01:15
XP authorizes engagement	01:16
ERGM fired	01:19

Notes to table:

(1). These events appear in the wrong sequence.

(2). This is IRC statement from ANZAC that they turned the ANZ block blue in their display. This does not appear in the FBE net ADOCS.

(3) This action was taken by BLR on behalf of ANZAC.

The interval between receipt of the nomination in ADOCS and the impact of the rounds was 1 hour and 46 minutes. No NLT time was specified for this target.

The mission was not promoted to the JTST

It was never defined if the convoy was moving or stationary. Since it was WTP to ERGM the presumption is that it was stationary.

The event timeline IRC entries show detailed reporting regarding the color block changes that are being made to the ADOCS display (e.g., see the interval 1:07 –1:12). This is attributable, in part, to uncertainty among some participants about the TST procedures and, in part, to the lack of confidence in ADOCS to accurately reflect, in a timely manner, the operator block actions to all ADOCS workstations. These detailed communications result in an expansion of the

engagement timeline and, in effect, make ADOCS redundant – all the coordination actions appear to be occurring in chat and ADOCS becomes unnecessary.

The table below gives the times of ADOCS block actions reported in chat compared to the times of block actions reported in the ADOCS Mission History. The time differences indicate approximately a four minute difference in the clocks used to timestamp the IRC and Mission History events.

Table B3.2. Time Correspondence of IRC and ADOCS Mission History Actions

	Time of Action		
Action	in IRC	in History	Comment
ANZ block W to Y	NA	23:47 01:07	
ANZ block Y to B	01:07	Does not occur	
ANZ block to G	01:09	01:13	History shows W to G
XPA block W to Y	00:29	00:29	
XPA block Y to B	01:11	01:15	
XPA block B to G	01:12	01:16	
FRD Y to G	01:14	01:19	

Color codes: W= white, B=blue, Y =yellow, G = green

Because the FBE net and Coalition net are disconnected, communications must be manually transferred from one net to the other. For example the FBE net reports at 1:10 that the XPA block is being turned blue. That message was introduced into the Coalition net IRC at 1:17. The lack of an automated filter (e.g**.** ISSE Guard) for IRC extends the engagement timeline.

2. TTP

The TTP step where the shooter turns his block green to acknowledgement assignment of the mission was not executed. In addition the following TTP procedures were neglected for this mission:

No TCT action
No deconfliction action
No georefinement action

In the BLR ADOCS Mission History no actions were reported as executed by ANZAC. All those actions which should have been executed by ANZAC were carried out on the BLR (e.g. BLR JOC accepts mission for ANZAC at 1:13). The IRC chat shows that the ANZAC was executing the required actions (see timeline at 1:07 and 1:10) but it appears that these events were not making it through Radiant mercury to the FBE net. The ADOCS TTP promulgated on May 1 (see Table 7) has the BLR putting into ADOCS the required ANZAC actions on receiving the IRC communications requesting those actions from the ANZAC. It is presumed this TTP was created to circumvent Radiant Mercury.

3. ADOCS

Table B3.3 Final state for Mission AB5027 from Different ADOCS sources

Source	TCT	XPA	E2X	DDX	ANZ	ADC	WRD	FRD	BDA
Mission History		G		G				G	
Mission Coordination: Fires display BLR		G					G	G	
Mission Coordination: Fires display Newport		G						G	

The information provided by the ADOCS coordination blocks is sometimes inconsistent. The IRC communications between 1:05 and 1:07 indicates the ANZ block in ADOCS is green in Australia, green and/or yellow in Newport, white on the BLR while the ADOCS Mission History indicates it should be yellow. The end state of the engagement also illustrates inconsistency in the ADOCS data (Table B3.3). The Mission History indicates that the final state of the XPA, ANZ and FRD blocks should be green, the Blue Ridge ADOCS display shows the XPA, WRD and FRD blocks green, the Newport ADOCS display shows XPA and FRD green. Other ADOCS anomalies are alluded to in the IRC comments at 1:07 and 1:22-1:23. These inconsistencies make it impossible to determine what actually occurred and defeat the use of ADOCS as a Fires planning and coordination tool.

Table B3.4 illustrates an inconsistent series of ANZ block actions. The fact that two different agents changed the block white to yellow is not explicable unless the action by the first agent had not been received by the second agent. A possible explanation for the second JOC change from white is an intermediate yellow to white change not logged in the Mission History.

Table 3.4 ANZAC Block Actions

Agent	Time	Color Change
ADOCS TECH	23:74	white to yellow
JOC STATION 3	1:07	white to yellow
JOC STATION 3	1:13	white to green

4. Timeline Actions and Events

April 29 GMT

23:42. ADOCS Fires Mission History, Fires Targeting Tab. Mission received in ADOCS. The Mission History log's first entry is 23:47.

23:47 ADOCS Fires Mission History. WTP to ANZAC ERGM.

23:47 ADOCS. Fires Mission History. BLR sets ANZ block to yellow which is defined as mission assigned to ANZAC.

23:50. IRC FIRES_COORD (Coalition channel). <ADOCS_AS> ALCON - we see WTP on

AB5027 - awaiting further processes

April 30 GMT
00:29. ADOCS Fires Mission History. BLR JOC turns XPA block yellow indicating the mission is being worked.
00:57. IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> FYI - we are still waiting for XP ANZ to say that they have turned ANZ Tab yellow (AB5027)
[01:04] IRC. ANZAC_OPS <XP_ANZAC> We are now working AB5027. Does ANZAC acknowledge the mission. I've so, please acknowledge via chat and I will change table color to blue.
[01:05] IRC. ANZAC_OPS <CO_ANZAC> ANZ green in AUS and NPT
[01:05] IRC. FIRES_COORD (Coalition channel). <CO_IKA_2> His ANZ tab is yellow on AB5027
[01:06] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> ack AB5027 ANZ is yellow
[01:06] IRC. ANZAC_OPS <XP_ANZAC> ANZ is white on BLR.
[01:07] IRC. ANZAC_OPS <XP_ANZAC> Fires mission manager for ANZ tab resets to white for every RMG transmission. The work around is for ADOCS operator BLR to edit tabs.
01:07. ADOCS Fires Mission History. BLR JOC turns ANZ block yellow.
[01:07] IRC FIRES_COORD (Coalition channel). <ADOCS_AS> will turn ANZ to blue
[01:07] IRC FIRES_COORD (Coalition channel). <ADOCS_AS> ANZ turned to blue
[01:08] IRC. ANZAC_OPS <XP_ANZAC> I'm turning ANZ tab green for AB5027.
[01:09] IRC. ANZAC_OPS <XP_ANZAC> ANZ tab is green for AB5027.
[01:10] IRC. ANZAC_OPS <XP_ANZAC> XP ack msn acceptance - turning XPA blue
[01:10] IRC FIRES_COORD (Coalition channel). <ADOCS_AS> ANZ tab green
[01:11] IRC. ANZAC_OPS <XP_ANZAC> XPA is blue.
[01:12] IRC. ANZAC_OPS <XP_ANZAC> XP auth engagement - turning XPA green.
[01:12] IRC. ANZAC_OPS <CO_ANZAC> rgr-will engage
01:13. ADOCS Fires Mission History. BLR JOC turns ANZ block green indicating mission accepted..
[01:14] IRC FIRES_COORD (Coalition channel). <CO_IKA_2> XP turning ANZ green for AB5027
[01:14] IRC. ANZAC_OPS <CO_ANZAC> Shot over. WRD Green, FRD White
[01:14] IRC. ANZAC_OPS <XP_ANZAC> Rgr. Changing FRD tab green.
[01:15] IRC. ANZAC_OPS <XP_ANZAC> FDR Green, BDA Yellow - Mission complete
01:15. ADOCS Fires Mission History. BLR JOC turns XPA block blue indicating acknowledement of mission acceptance.
[01:16] IRC FIRES_COORD (Coalition channel). <CO_IKA_2> ANZ green from XP
01:16. ADOCS Fires Mission History. BLR JOC turns XPA block green - cleared to engage.
[01:17] IRC. FIRES_COORD (Coalition channel). <CO_IKA_2> XP turning XPA blue
[01:17] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> why? 5 is XP turns ANZ blue
[01:18] < IRC. FIRES_COORD (Coalition channel). CO_IKA_2> XPA Green-you may engage
[01:19] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> rgr engaging
[01:19] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> shot – over
[01:19] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> ab5027 wrd green frd white

01:19. ADOCS Fires Mission History. BLR JOC turns FRD block green
[01:21] IRC. FIRES_COORD (Coalition channel). <CO_IKA_2> rgr. XP shows MC
[01:22] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> wrd white frd green here
[01:22] IRC. FIRES_COORD (Coalition channel). <DJS> ANZAC_C2 rgr That was weird WRD GRN, FRD WHT, BDA GRY to WRD WHT, FRD GRN, BDA GLD
[01:23] IRC. FIRES_COORD (Coalition channel). <ADOCS_AS> we see the same here
[01:23] IRC. FIRES_COORD (Coalition channel). <DJS> rgr . possibly a hiccup due to BLR COMMS TU B4
[01:27] IRC. GISRC_ISR (Coalition channel). <GISR-AS> watch for impact of ergm for bda assessment on convoy, tgt ab5027
[01:28] IRC. GISRC_ISR (Coalition channel). <ANZAC_C2> splash out
[01:30] IRC. GISRC_ISR (Coalition channel). <UAVContro> SPOTTER camera view of DEAD 1xtruck TGT ab5027 --- COAL

Annex B4 - Nomination GX 0321

1.Timeline

GX0321 was a May 1 nomination of a Field artillery target by the DDX GISRC. The target was prosecuted with an ALAM by the ANZAC**.** Table B4.1 shows the critical timeline events. All actions and IRC communications related to the GX0321 engagement are listed in Section 4.

Table B4.1 GX0321 Timeline

Event	Time
Nomination sent from DDX	2:00?
Nomination received in ADOCS	2:43
Nomination promoted to JTST	3:10
Begin strike planning (TCT yellow)	No done
XP acknowledges mission	3:18
WTP to ANZAC	3:34
ANZ assigned mission	3:36
ANZ acknowledges mission	3:36 (1)
ADC initiates deconfliction	3:37
Deconfliction completed	Not done
ANZ accepts mission	3:46 (1)
XP acknowledges mission acceptance	3:46
XP authorizes engagement	3:47
ALAM Fired	3:50
Impact	3:51
Confirm as TST	4:32 (2)
NLT time	4:46

Notes to Table:

(1) Action taken on BLR on behalf of ANZAC
(2) Out of sequence. The target was confirmed as TST only after the engagement was completed.

There is long interval between the presumed time of transmission of the mission from GISRC and its receipt by ADOCS and a substantial delay between receipt of the mission in ADOCS and WTP. Thereafter, the process proceeds relatively quickly. The total interval between receipt of the nomination in ADOCS and the launch of the weapon is 67 minutes.

The nomination was received in ADOCS with CE and LE values set to 1. These values appear in the Mission History but do not appear in the Mission Coordination: Fires Targeting tab. The nomination was based on UAV imagery so this level of accuracy is unrealistic. There is no indication that the UAV imagery was sent to PTW for georefinement although such an action would help account for the long delay in the receipt of the nomination at ADOCS. If the shooter took the provided target position LE and CE at face value the accuracy of the coordinates was more than adequate to the needs of the ALAM precision munition. However, at the time of fire the shooter announced (3:50) he didn't know or care if the target had been georefined.

The details of the timeline are blurred by the fact that system times are not synchronized. A comparison of the same events in the FBE net IRC log and the ADOCS Mission History shows the events are 2-3 minutes later in ADOCS. For example, IRC reports the ANZ tab is blue at 3:38, the Mission History log reports it blue at 3:36. There has been no attempt to synchronize the times derived from different sources in Table B4.1.

The target nomination was promoted to the JTST Manager at 03:10. Since the target was nominated and executed within the JFMCC, the appearance in the JTST was not required for execution but for cross-Component situational awareness. The JTST Mission History files do not exist in FBE-K for May 1 and 2.

2.TTP
Because the FBE net IRC and Coalition net IRC are not connected communications are manually recreated in one from the other. The time lag is approximately seven minutes

> The deconfliction was never completed but the mission was nevertheless fired.
> The target was confirmed as TST only after the engagement was completed.
> A precision munition was fired without concern for georefinement.

The required shooter (ANZAC) ADOCS actions were performed by the BLR presumably to circumvent problems with the ADOCS - Radiant Mercury interface

3. ADOCS
At 2:00 Dahlgren reported it would nominate GX0231 shortly. The nomination was not received in ADOCS until 2:46. There are no communications relating to the cause of this delay. The facts that at 3:13 DDX reports it does not show GX0231 in his ADOCS display and the Newport ADOCS log does not show GX0231 suggests ADOCS communications may be the

problem. The absence of GISRC data does not permit the determination of the actual time of the nomination transmission.

The ADOCS Mission History indicated the BLR turned the XPA block blue at 03:15. supposedly indicating XP acknowledges the shooters acceptance of the mission. This is erroneous as the chat indicates at this time that the shooter had not received the mission.

There are multiple examples in the Mission History of blocks being changed from colors that they do not hold. For example, at 3:15 XPA changed from white to blue (by BLR SPARE 4 ADOCS workstation). The next recorded action for that block show it being changed at 3:18 from white to yellow (by the BLR JOC STATION 3). Two possible explanations for this: there is an event changing the block from blue to white missing from the Mission History log or the change at 3:15 was not received by the second workstation so in his context the block was still white .

The table below illustrates inconsistencies in the final state of the mission display based on the three sources indicated. From IRC it is clear the mission was fired but in none of the ADOCS displays: BLR Fires, BLR JTST and Newport Fires, or in the Fires Mission History is it indicated the mission was fired.

Table B4.2. Final State of the GX0321 Mission from three sources

Source	TCT	XPA	ANZ	ADC	WRD	FRD
Mission History	G	G	G	R	W	W
Mission Coordination: Fires display BLR	G	G	W	W	G	Y
Mission Coordination: Fires display NPT	Mission does not appear					

4. Timeline Actions and Events

[01:51] IRC. DDX_UAV_CNTRL <Dahlgren> when ready, pls surv artillery in vic of radars
[01:51] IRC. DDX_UAV_CNTRL <UAV2> BAK ok
[01:53] IRC. DDX_UAV_CNTRL <UAV2> FA site contact -- 6xTUBES, 1-C2, VIC 150356N 1453655E DA 30 SP ARTY
[01:54] IRC. DDX_UAV_CNTRL <UAV2> FA site of all VEH(S) in current view
[01:54] IRC. DDX_UAV_CNTRL <UAV2> TGT #?
[01:55] IRC. DDX_UAV_CNTRL <Dahlgren> can you zoom over left lower quads
[01:56] IRC. DDX_UAV_CNTRL <UAV2> What are you looking for?
[01:57] IRC. DDX_UAV_CNTRL <Dahlgren> pls zoom to PID veh lower left quad?
[01:57] IRC. DDX_UAV_CNTRL <UAV2> The last tube or truck in current view?
[01:58] IRC. DDX_UAV_CNTRL <Dahlgren> just crossing crosshair x axis now
[01:59] IRC. DDX_UAV_CNTRL <Dahlgren> got it. Thanks
[01:59] IRC. DDX_UAV_CNTRL <UAV2> FREEZE ON!!!!!!!!!!!!!!!
[01:59] IRC. DDX_UAV_CNTRL <UAV2> Releasing
[01:59] IRC. DDX_UAV_CNTRL <UAV2> TGT #? for FA site??????????????????????????

[02:00] IRC. DDX_UAV_CNTRL <Dahlgren> GX0321 - will send out nom shortly
02:43. ADOCS. Fires targeting tab. Mission recived in ADOCS. Mission History gives a time of 2:46.
[02:44] IRC. DDX_UAV_CNTRL <Dahlgren> can we get overview of Batt with all 7 FAs?
[02:45] IRC. DDX_UAV_CNTRL <UAV2> on screen now
[02:46] IRC. DDX_UAV_CNTRL <Dahlgren> can you move away fm coast to get lower left quad but within overview?
[02:46] IRC. DDX_UAV_CNTRL <UAV2> will this work?
02:46 ADOCS. Fires Mission History. DDX GISRC nomination received in ADOCS. The Targeting tab reports the time received is 02:43
[02:50] IRC. DDX_UAV_CNTRL <Dahlgren> closer in pls
[02:51] IRC. DDX_UAV_CNTRL <UAV2> is this close enough?
[02:52] IRC. DDX_UAV_CNTRL <Dahlgren> good for overview - need lower left quad for PID on those
03:10 ADOCS. Fires Mission History. BLR JOC promotes nomination to JTST Manager.
[03:13] IRC. MARITIME_OPS <XP_DDX> where did GX0321 come from?
[03:15] IRC. MARITIME_OPS <TAO_vDDX> XP... DDX does not show GX0321 in ADOCS.
03:15. ADOCS. Fires Mission History. BLR changes XPA block from white to blue. This is an inappropriate action.
03:18. ADOCS. Fires Mission History. BLR JIC Air IPB changes XPA block from white to yellow indicating XP acknowledges and is processing the mission.
[03:29] IRC. ANZAC_OPS <XP_ANZAC> Stby - We have a TST. GX0321. Let's run this one to ground before DV's.
[03:29] IRC. TECHNICAL_COORD <vDDXSHREK> BLR_DJ - do you have a tgt GX0321?
[03:32] IRC. ANZAC_OPS <XP_ANZAC> ANZAC - You have WTP ANZAC-ALAM on GX0321 at 0335z.
[03:33] IRC. ANZAC_OPS <XP_ANZAC> Msn asgn to ANZAC, XPA/ANZ is Green/Green.
[03:33] IRC. TECHNICAL_COORD <BLR_DJ> i saw it come in but don't see it now
[03:34] IRC. TECHNICAL_COORD <BLR_DJ> ohh ok i c it now
03:34 ADOCS. Fires Mission History. BLR WTP GX0321 to ANZAC and ALAM
[03:34] IRC. ANZAC_OPS <XP_ANZAC> ADC rgr up red. Continue with msn planning, expect deconflict by time of engagement.
[03:34] IRC. ANZAC_OPS <XP_ANZAC> VANZAC pls ack msn
[03:36] IRC. ANZAC_OPS <XP_ANZAC> GX0321 - Field Artillery. Do you see it. It's a TST.
[03:36] IRC. ANZAC_OPS <CO_ANZAC> Yes-we have GX0321
03:36. ADOCS. Fires Mission History. BLR JOC changes ANZ block from white to yellow indicating the mission is assigned to the ANZAC
03:36. ADOCS. Fires Mission History. BLR JOC changes XPA block from blue to yellow. Inconsistent action
03:36. ADOCS. Fires Mission History. BLR JOC turns ANZ block blue indicating the shooter has acknowledged the mission.
03:37. ADOCS. Fires Mission History. BLR changes ADC block to red indicating deconfliction pending.
[03:37] IRC. ANZAC_OPS <XP_ANZAC> Rgr - awaiting your ack of msn.
[03:38] IRC. ANZAC_OPS <CO_IKA_1> Rgr, ANZAC ack msn

[03:38] IRC. ANZAC_OPS <XP_ANZAC> Rgr - ANZ tab is blue.
[03:39] IRC. FIRES_COORD (Coalition channel) <CO_IKA_1> XP is stating that you have WTP ANZAC-ALAM on GX0321 at 0335z
[03:40] IRC. FIRES_COORD (Coalition channel) <CO_IKA_1> XP states that msn asgn'd ANZAC, XPA/ANZ is Grn/Grn
[03:40] IRC. ANZAC_OPS <XP_ANZAC> XP awaiting ANZAC msn acceptance.
[03:40] IRC. ANZAC_OPS <CO_IKA_1> ANZAC accepts msn.
[03:41] IRC. TECH_SIM (Coalition channel)<Coalition> UAVContro, what are coords for GZ0321
[03:42] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> we just had that upgraded to WTP and XPA yellow
[03:42] IRC. ANZAC_OPS <CO_IKA_1> Interrogative step 1. XP turns XPA Tab yellow?
[03:43] < IRC. ANZAC_OPS XP_ANZAC> Rgr - Looks like we got a RMG blast. We lost our colors. I just reset.
[03:43] IRC. ANZAC_OPS <XP_ANZAC> XPA blue and ANZ green.
[03:43] IRC. ANZAC_OPS <XP_ANZAC> XP auth VANZAC engagement.
[03:43] IRC. FIRES_COORD (Coalition channel) <CO_IKA_1> do u ack msn?
[03:44] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> yes - we ack the msn
[03:44] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> what about step 3?
[03:45] < IRC. FIRES_COORD (Coalition channel) CO_IKA_1> XP shows ANZ blue
[03:45] IRC. ANZAC_OPS <CO_IKA_1> ALAM away GZ0321.
[03:45] IRC. ANZAC_OPS <CO_IKA_1> CONPT and ANZAC has wrd-grn, frd-gold
03:46. ADOCS. Fires Mission History. BLR JOC turns ANZ block green indicates the ANZAC has accepted the mission.
03:46. ADOCS. Fires Mission History. BLR JOC turns APX yellow to blue indicating XP acknowledges mission acceptance.
[03:46] IRC. ANZAC_OPS <CoalMike> 1 ALAM away from ANZAC
[03:46] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> ANZ tab green
[03:46] IRC. TECH_SIM (Coalition channel)<ANZAC_C2> GX0321 is on SAIPAN ,.Stby co-ords for GX0321
[03:46] IRC. TECH_SIM (Coalition channel)<ADOCS_AS> coal-mike - next strike is GX0321 - Field Arty - 1 X ALAM in posn 150400.68N 1453647.62E. Will advise when firing
03:47. ADOCS. Fires Mission History. BLR JOC turns XPA block from yellow to green indicating the engagement is authorized.
[03:49] IRC. FIRES_COORD (Coalition channel) <CO_IKA_1> XP is showing XPA-blue, ANZ-grn
[03:50] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> rgr XPA blue here, now green
[03:50] IRC. FIRES_COORD (Coalition channel) <CO_IKA_1> XP authorizes engagement
[03:50] IRC. FIRES_COORD (Coalition channel) <DJS> FIRE!!!
[03:50] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> was tgt geo refined?
[03:50] IRC. FIRES_COORD (Coalition channel) <DJS> don't know, don't care/
[03:50] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> rgr engaging
[03:50] IRC. FIRES_COORD (Coalition channel) <ANZAC_C2> ALAM away GX 0321
[03:51] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> bird away
[03:51] IRC. FIRES_COORD (Coalition channel) <ADOCS_AS> wrd green frd gold

[03:51] IRC. ANZAC_OPS <CoalMike> splash – out

4:32 ADOCS. Fires Mission History. BLR turns the TCT to green indicating the target is a confirmed TST
4:46 ADOCS. NLT time

Annex B5 - Nomination AA0368

1.Timeline

AA0368 is a May 1 GMT (May 2 experiment day) nomination of a CDCM site by the ANZAC ADOCS. The target was prosecuted by the DDX firing a TLAM. Table B5.1 shows the critical timeline events. All actions and IRC communications related to the AA0368 engagement are listed in Section 4.

Table B5.1 AA0368 Timeline

Event	Time
Target acquired	21:52
Nomination received in ADOCS	22:01
Nomination promoted to JTST	22:01
Begin strike planning	22:01
WTP to ANZAC and ERGM	22:35
Amend WTP to DDX and TLAM	22:38
Target confirmed as TST	22:45
XP acknowledges mission	22:46
ANZAC reports unable to engage	22:48 (1)
Deconfliction initiated	22:48
DDX mission assignment	Not done (2)
DDX ack of assignment	Not done (2)
TLAM route request received at RPM	22:56
TLAM route sent from RPM	22:58
Deconfliction complete	23:12
XP authorizes engagement	23:12
DDX accepts mission	23:16
XP ack mission acceptance	Not done
DDX sets fire when ready	23:18
TLAM fired	23:18
Detonation	23:24
BDA report	23:28
NLT time	03:59

Notes to Table:

ADOCS action taken by BLR on behalf of ANZAC

(1) See Section 2.

The interval between the receipt of the target in ADOCS and the firing of the TLAM was one hour and 17 minutes.
ADOCS time stamped events about 3 minutes after the events were reported in IRC.

2.TTP
The ADOCS DDX actions are confused. The ADOCS procedure defined in Table 8 indicates the shooters block should be turned yellow by XP when the mission is assigned. In this case, there is no action on the DDX ADOCS block taken by the BLR and the first two actions by the DDX are not consistent with the TTP.

Table 5.2 DDX Block Actions

Agent	Time	Color Change
DDX SHOOTER 1	22:48	white to blue
DDX SHOOTER 1	23:01	blue to yellow
DDX SHOOTER 1	23:16	yellow to green

XP did not acknowledge DDX acceptance of the mission. This is probably a consequence of the fact that the DDX actions were confused.

3.ADOCS

Table 5.3. Final State of the AA0368 Mission from three sources

Source	TCT	XPA	DDX	ANZ	ADC	WRD	FRD	BDA
Mission History	G	G	G	R	G	G	G	G
Mission Coordination: Fires display BLR	G	G	G	R	G	G	G	G
Mission Coordination: Fires display Newport	G	G	G	R	G	G	G	G

In this instance all three data sources agree on the final state of the engagement

4.Timeline Actions and Events
[21:46] IRC. GISR_ISR (Coalition channel) <UAVContro> New Contact -- Possible DECOY SS21 VIC 151057N 1454302E DA 21 – COAL
[21:46] IRC. GISR_ISR (Coalition channel) <UAVContro> DARK Pattern on SS21
[21:46] IRC. GISR_ISR (Coalition channel) <UAVContro> I still think DARK Pattern MEANS DECOY SS21 -- COAL
[21:47] IRC. GISR_ISR (Coalition channel) <UAVContro> Looking for support Veh(s) searching

[21:48] IRC. GISR_ISR (Coalition channel) <UAVContro> New contact -- 2nd POSSIBLE DECOY 1xSS21 VIC 151026N 1454257E DA 27 – COAL
[21:48] IRC. GISR_ISR (Coalition channel) <UAVContro> Need TGT# for 1st DECOY SSS21
[21:49] IRC. GISR_ISR (Coalition channel) <GISR-AS> 1st aa0366
[21:49] IRC. GISR_ISR (Coalition channel) <GISR-AS> 2nd aa0367
[21:49] IRC. GISR_ISR (Coalition channel) <UAVContro> 1st aa0366 for 151057N 1454302E, yes
[21:50] IRC. GISR_ISR (Coalition channel) <GISR-AS> affirm
[21:50] IRC. GISR_ISR (Coalition channel) <UAVContro> No other support veh(s) in area, AGAIN think these are DECOY(s)
[21:50] IRC. GISR_ISR (Coalition channel) <UAVContro> Researching area for Support Veh(s) - standby
[21:51] IRC. GISR_ISR (Coalition channel) <GISR-AS> 3rd vehicle?
[21:51] IRC. GISR_ISR (Coalition channel) <UAVContro> New Contact -- 3rd DECOY SS21 -- VIC 151020N 1454256E DA 28 - -COAL
[21:51] IRC. GISR_ISR (Coalition channel) <UAVContro> SPOTTER VIEW
[21:52] IRC. GISR_ISR (Coalition channel) <UAVContro> See the DARK CAMO pattern?
[21:52] IRC. GISR_ISR (Coalition channel) <UAVContro> Clouds coming in and out
[21:52] IRC. GISR_ISR (Coalition channel) <UAVContro> Waiting for TGT#
[21:52] IRC. GISR_ISR (Coalition channel) <GISR-AS> aa0368
22:01 ADOCS . Fires Mission History. Nomination received in ADOCS from BLR JOCC.
22:01 ADOCS . Fires Mission History. BLR JOCC changes TCT block from white to yellow indicating the target is a possible TST target.
22:01 ADOCS . Fires Mission History. BLR JOCC. Mission promoted to the JTST Manager.
[22:03] IRC. ANZAC_OPS<XP_ISR> XP_AZAC: request imagery for AA0366/67/68 to ID as a potential TST
[22:03] IRC. #FIRES_COORD (Coalition channel) <ADOCS_AS> AA0367/0368/0369 targeted
[22:06] IRC. JTF_ISR_COORD <TST> JFN_J2_OP: WRT: AA0368 we're going to need imagery for PID as well as CDE support and post-strike BDA once target is PID and approved as TST.
[22:09] IRC. #FIRES_COORD (Coalition channel) <ADOCS_AS> FYI - have now targeted 5 targets via ADOCS, awaiting WTP by XP
[22:15] IRC. ANZAC_OPS <XP_ANZAC> We see AA0358, 66, 67, 68, 69, 70, and 73.
[22:22] IRC. JTF_ISR_COORD <TST> MCC: AA0366, AA0367, AA0368 have been passed to you; awaiting your acknowledgement.
22:35 ADOCS . Fires Mission History. BLR JOC. WTP to ANZAC and ERGM
22:38 ADOCS . Fires Mission History. BLR JOC. WTP changed to DDX and TLAM.
22:45 ADOCS . Fires Mission History. BLR JOCC changes TCT from yellow to green indicating target is confirmed TST
22:46 changes XPA block to yellow indicating XP acknowledges the mission
[22:46] IRC. GISR_ISR (Coalition channel) <UAVContro> Update aa0368 DECOY SS21 still there -- lower part of view
22:48 ADOCS . Fires Mission History. BLR changes E2X block blue.
22:48 ADOCS . Fires Mission History. BLR changes ANZ block red indicating ANZAC is unable to engage.

22:48 ADOCS . Fires Mission History. BLR changes ADC block red indicating deconfliction is underway.
[22:48] IRC. MARITIME_OPS <XP_DDX> DDx TAO, can you strike AA0368
[22:48] IRC. MARITIME_OPS <XP_DDX> IF so req box blue on DDX to tell us IAW with 1 May process
22:48 ADOCS . Fires Mission History. DDX turns DDX block blue to acknowledge.
22:51 ADOCS . Fires Mission History. BLR turns E2 block from blue to white
[22:51] IRC. MARITIME_OPS <TAO_vDDX> XP... DDX req confirm AA0368.
[22:51] IRC. MARITIME_OPS <XP_DDX> Also if assigned msn (WTP) go to yellow
[22:51] IRC. MARITIME_OPS <XP_DDX> Confirm aa0368? What do you need to know
22:56. RPM. TLAM route request received.
22:58 RPM. TLAM route sent.
[22:58] IRC. MARITIME_OPS <TAO_vDDX> XP... DDX can accept AA0368.
[22:58] IRC. MARITIME_OPS <XP_DDX> Block just changed to yellow DDX
[22:58] IRC. MARITIME_OPS <TAO_vDDX> XP.. request permission to engage AA0368
23:01 ADOCS . Fires Mission History. DDX turns DDX block from blue to yellow to indicate acceptance?
[23:02] IRC. MARITIME_OPS <TAO_vDDX> rgr yellow block for AA0368
23:12 ADOCS . Fires Mission History. BLR turns ADC from red to green indicating deconfliction complete.
23:12 ADOCS . Fires Mission History. BLR turns XPA yellow to green indicating engagement is authorized.
[23:15] IRC. MARITIME_OPS <TAO_vDDX> XP... DDX Greyhound away AA 00368 TOF 8:30
23:16 ADOCS . Fires Mission History. DDX turns the DDX block yellow to green indicating meaning the mission is accepted
23:18 ADOCS Fires Mission History. DDX turns the WRD block green.
23:18 ADOCS Fires Mission History. DDX turns the FRD block green.
23:23:46 SNN. Detonation report.
23:28 ADOCS Fires Mission History. DDX turns the BDA block green with the comment the target is destroyed.
03:59 ADOCS NLT time.

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Appendix C FBE-K TECHNICAL AFTER-ACTION REVIEW

This Appendix was provided by Wayne "Doc" Sweitzer of Titan Corporation

Summary

PURPOSE. The use of the Joint Fires Network (JFN), and in particular its Tactical Exploitation System - Navy (TES-N) subsystem, to support Time Sensitive Targeting (TST) was a major focus of the Sea Strike Initiative in Tandem Thrust 2003 (TT03) / Fleet Battle Experiment Kilo (FBE-K). This paper recounts the technical issues encountered during TT03/FBE-K, as well as functional issues that had a significant technical impact, and makes recommendations for future improvements.

DEFINITIONS. The following are definitions of systems terminology used in this paper:

- **JFN - Joint Fires Network:** a recent name change for NFN which is little more than a programmatic attempt to indicate that NFN is now a joint program -- which it is not.
- **NFN - Naval Fires Network:** as of FBE-K execution, NFN was still the official term for the "converged architecture" of three programs: TES-N, JSIPS-N, GCCS-M. Unfortunately, the former TES-N program office (NAVSEA PMS-454) perpetuated the use of the term "NFN" to refer to TES-N only, thereby introducing great confusion in the Fleet and elsewhere -- confusion that was still painfully evident during TT03/FBE-K.
- **TES-N - Tactical Exploitation System - Navy:** TES-N is an immature integration (in systems development terms) of a number of complex, powerful software and hardware applications that overwhelmingly fall in the functional category of Intelligence, Surveillance, Reconnaissance (ISR).
- **JSIPS-N - Joint Service Imagery Processing System - Navy:** aboard USS BLUE RIDGE (BLR), JSIPS-N included the Precision Targeting Workstation (PTW), NIMA's Image Product Library (IPL), and the connectivity (via Challenge Athena III) with the Joint Concentrator Architecture (JCA) IPL located at the Office of Naval Intelligence (ONI) in Suitland, MD.
- **GCCS-M - Global Command and Control System - Maritime:** among many other things, GCCS-M is the "engine" for the Common Operational Picture (COP) shared force-wide. TES-N is supposed to be an important contributor to the COP; it is not.
- **ADOCS - Army Deep Operations Coordination System:** ADOCS was the primary "intended target" of TES-N output, in the form of ATI.ATR target nomination messages. While only sometimes included in even the loosest use of the term "JFN", ADOCS (which is also known in Navy circles as "LAWS") is the only real connection TES-N / JFN on BLR had to "fires".
- **AFSERS-MUSE - Air Force Synthetic Environment for Reconnaissance and Surveillance-Multiple Unified Simulation Environment:** AFSERS-MUSE was a modeling and simulations (M&S) system that fed TES-N with simulated ISR video (e.g., from a simulated UAV or simulated P-3 AIP aircraft), and with simulated U-2 still imagery and platform/sensor telemetry. Although "MUSE" and "AFSERS" are virtually synonymous, MUSE was commonly used during TT03/FBE-K execution and planning to

refer to just the simulated ISR video produced by M&S Central in Simms Hall, Newport, RI. (The U-2 M&S "pieces" were referred to as "AFSERS-TENCAP" -- see below).

- **AFSERS-TENCAP - Air Force Synthetic Environment for Reconnaissance and Surveillance-Tactical Exploitation of National Capabilities:** AFSERS-TENCAP was the term commonly used during TT03/FBE-K execution and planning to refer to the U-2 M&S "pieces" (i.e., U-2 still imagery and platform/sensor telemetry), produced by the AFSERS system on board USS BLUE RIDGE (BLR) and sent to TES-N.
- **ISR UUV - Intelligence, Surveillance, Reconnaissance Unmanned Underwater Vehicle:** "ISR UUV" is used herein to refer to the virtual SSN and its two simulated ISR UUVs that participated during the FBE-K FTX as ISR "collectors". The Naval Undersea Warfare Center (NUWC) provided sophisticated simulation of vSSN and ISR UUV platform behavior and ELINT/ESM collection and reporting, along with rudimentary COMINT and IMINT "proof-of-concept" simulation and reporting.

Highlights

- Remote M&S stimulation of TES-N / JFN was sufficient for familiarizing C7F Staff with the basic processes involved in using TES-N / JFN in support of TST.
- Successful demonstration of TST Target Folder server concept as common repository for relevant TST target data.
- Gained in-depth insights into many JFN systems issues, myths and realities.
- All simulated Blue ISR assets displayed in COP simultaneously with appropriate labels by end of FTX.

Technical Accomplishments & Issues

A. <u>SYSTEMS</u>.

1. TES-N. The TES-N suite used in TT03 / FBE-K was already "organic" to USS BLUE RIDGE (BLR) -- no major alternations or upgrades were done specifically for TT03 / FBE-K, although the system software had just recently (Jan or Feb 2003) been upgraded to TES-N version 5.0. Other systems/components used in conjunction with TES-N included:

2. **JSIPS-N / PTW** (organic to BLR)
3. **IPL / JCA** (organic to BLR)
4. **GCCS-M** (organic to BLR)
5. **ADOCS** (software installed on BLR organic IT-21 PCs)
6. **ISR-M** (organic to PACAF AOC, Hickam AFB, HI)
7. **TES-N RTC** (organic to USS ESSEX)
8. **M&S systems, including:**
    a. JSAF (Newport M&S lab)
    b. AutoSIGS (Newport M&S lab)
    c. ASSET (Newport M&S lab)
    d. AFSERS-MUSE (Newport M&S lab)
    e. Video controller / video remote (Newport M&S lab / aboard BLR)
    f. AFSERS-TENCAP (aboard BLR)
    g. ISR UUV (at NUWC Newport)

B. M&S FEEDS INTO TES-N.

1. Video:

a. ACCOMPLISHMENTS: During both CPX and FTX, simulated ISR video was produced by AFSERS-MUSE, fed into the NWDC video controller in Newport, distributed as MPEG-4 to BLR via the FBE WAN (including KuBand SATCOM). The MPEG-4 stream was converted and fed by the NWDC video remote server on BLR as analog video (RS-170) into TES-N's video switch, which then presumably re-digitized the video for distribution to any GENSER-level TES-N Multi-Function Workstation (MFWS) [unable to confirm precise "inner workings" of TES-N internal video distribution].

b. ISSUES/COMMENTS:

(1) Video Feed Stability. The video feed into TES-N was stable and reliable during both CPX and FTX, aside from one very minor issue: the BLR video remote server's display properties had to be re-set by one of the NWDC Facilitators (Sweitzer or Meana) to 800x600 or higher approximately once a day, normally first thing in the morning BLR time (the display properties would somehow revert to 640x480 on occasion and then freeze the display).

(2) Simulated ISR Video "Command and Control". The M&S "pilots" who were "flying" the simulated ISR video platforms were thoroughly supportive and professional. Their flexibility, and the flexibility of their M&S systems, allowed NWDC Facilitators on BLR the latitude to respond rapidly to changes in circumstances and/or FBE participant requirements when needed. On only a few occasions there was confusion introduced by other FBE participants (e.g., vDDX at Dahlgren) as to who had "command and control" over which simulated ISR video asset when. While not a technical issue per se (and probably not an unrealistic situation in the "real world") this underscored the importance of having (and participants adhering to) a well-established C2 structure for ISR operations, even in an experimental environment. Also, the initial plan to coordinate with the "pilots" via voice-only proved to be unwieldy, primarily because the TES-N video screener(s) did not have exclusive access to an IP phone/headset at his/her workstation, and as such had to coordinate by voice across the room to someone (NWDC Facilitator in lieu of an ISR operations type) who was on the IP phone with the "pilot". By early in the CPX, the TES-N FSRs had configured TES-N's IRC chat tool to allow screeners and "pilots" to interface directly via chat, which was a far superior arrangement from the screener's perspective to going through the intermediary.

(3) TES-N Video Application. The TES-N video display and capture application was generally reliable, but has a strange software bug in that the user's video control icons (e.g., start, stop, capture, etc.) do not display upon initially opening the window until the user moves the cursor over that area in the window (i.e., on the border between the video frame itself and the upper edge of the window).

(4) Video Quality.

(a) As viewed on TES-N MFWS: By the time the video was displayed on the TES-N MFWS (an "A-to-D" conversion or two AFTER leaving the video remote server), the quality of the video simulation was barely useable for the purposes of having TES-N users "go through the motions" of Time Sensitive Target (TST) detection and identification. For instance, the NWDC Facilitators on BLR would often have to go to another

space on BLR to read the latitude/longitude readout on the video remote server screen, as those same numbers were illegible on the TES-N screen.

(b) Video capture: The video image "chips" captured by TES-N were of significantly lower quality than those captured from the same source by the GISRC workstations used in the FTX in Newport and Dahlgren, as evidenced by comparing the captured images posted to the TST Target Folder Server by each of the systems.

(c) Base image and model quality: For future consideration, even with improved TES-N video handling, the quality of the simulated video used in FBE-K would not be sufficient for any type of analytic/targeting experimentation (beyond just "going through the process motions") due primarily to the resolution and two-dimensional nature of the base imagery used. Three supporting points:

[1] For instance, when zoomed in close enough to support positive identification (PID) of the TST, the background of base imagery became so blurred as to appear solid, thereby losing all visual context, and making the 3-D model target look as if it were "free-floating" in air or water.

[2] Furthermore, the combination of the low resolution of the available base imagery, coupled with the lack of features that are easily identified at coarse image resolution (e.g., cross-roads, bridges, population centers) on the Northern Mariana Islands (e.g., Rota, Saipan, Tinian), was insufficient to support actual "visual point transfer" by PTW operators between the captured video images and the Digital Point Positioning Database (DPPDB).

[3] Finally, while the three-dimensional models of the TST vehicles and other equipment are good, they are too easy to pick out (initial detection), as they "lay on top" of the terrain instead of being part of it, thereby providing a false sense of the level of difficulty of initial TST detection with a video sensor (e.g., would provide false results in any attempt to quantify the TST timeline if measured from receipt of initial "tipper" indications or before).

(5) Video Platform/Sensor Telemetry. As in MC02/FBE-J, TES-N could not do any parsing or processing of the telemetry data provided by the ISR video platform M&S system other than display it, on-screen, "burned in" as part of the video images themselves. This resulted in the manual entry of data, particularly latitude/longitude, into the TES-N target nomination creation template, significantly increasing both the time required, and the risk of data entry errors.

2. Imagery via JCA:

a. ACCOMPLISHMENTS: During both CPX and FTX, imagery from simulated national and other sources was produced in NITF format by the AutoSIGS system at M&S Central in Newport, and then transferred (FTP) to JCA's Command IPL located at ONI in Suitland, MD. JCA connectivity (via Challenge Athena III SHF SATCOM) allowed users aboard BLR to access the JCA IPL (via the web-based Quick Query or Q2 application), and pull the images down to the BLR IPL. From there they could be accessed by either PTW or TES-N, the latter of which could pull the images over to its own system server, and process the NITF headers to register the images in its DBO (Database Organizer) application.

b. ISSUES/COMMENTS:

(1) JCA IPL Access and Country Codes. There were two major hurdles to successful use of this method of image file transfer: (a) the long and difficult process of getting procedures and permissions to access the "real world" JCA IPL (technically simple, but "culturally" complex); and, (b) modifying AutoSIGS software to allow production of NITF headers with a country code of something other than the default "CC" (in this case, "CQ" -- the NIMA country code for Northern Marianas), as the IPL software, both at JCA and on BLR, requires the use of actual, validated country codes in NITF file headers. After much coordination, the AutoSIGS modifications were made, proper permissions were granted, and JCA IPL access procedures were developed in time to allow smooth operations by day four (17 April 2003) of the CPX, after which there were no significant issues encountered.

(2) AutoSIGS Image Quality. As with the simulated video, the simulated imagery quality was sufficient for analysts to run through proper procedures for information and process flow in support of TST. It would not, however, be sufficient for any experimentation involving actual imagery analysis, targeting, or battle damage assessment.

3. U-2 Dragon Lady simulation (from AFSERS-TENCAP aboard BLR):

a. ACCOMPLISHMENTS: During both CPX and FTX, attempts were made to simulate the inputs into TES-N that would come from a U-2 Dragon Lady aircraft if it were downlinking directly to BLR as its ground/surface station. These inputs fall into two categories:

(1) Images. Based on the collection tasking in the U-2 mission plan given to it (more on this in the "TES-N Outputs" section below), the AFSERS-TENCAP on BLR would FTP two images per collection "event" in NITF format to TES-N: a low-resolution image to the TES-N Screener application, and a high-resolution image of that same area of coverage to the TES-N DBO application.

(2) Telemetry. AFSERS-TENCAP provides a data stream (UDP) to TES-N that tells where the simulated U-2 is located at any given time, based upon the same mission plan referred to above (and in "TES-N Outputs" section below). This capability worked only briefly during TT03/FBE-K (last two days of CPX) because of a number of complex issues including an initial lack of mission plans, an initial lack of a required software script, errors in subsequent mission plans, and suspected software problems in TES-N (addressed elsewhere in this paper).

b. ISSUES/COMMENTS:

(1) Image Screener's "Waterfall". Contrary to previous belief, there exists no capability in AFSERS-TENCAP to provide the "waterfall" type of display in the TES-N Screener application that one would get from a live U-2 aircraft's SAR or EO/IR imaging sensors in "search" (vs. "spot") mode.

(2) Image Quality. The base imagery used by AFSERS-TENCAP of the Northern Marianas was a mix of 5-meter and 1-meter resolution imagery stitched together, providing significantly better resolution in some areas (where there was 1-meter coverage) than the base imagery used in AutoSIGS and AFSERS-MUSE.

(3) Telemetry Processing Script. To receive and process the telemetry data provided by AFSERS-TENCAP, TES-N needs to be running a script that is custom built for the task, and one that is apparently not part of the standard TES-N version 5.0 software build. The TES-N FSRs on BLR were unaware of any such script, but after several days of being convinced such a script existed, and then checking with the TES Operational Support Facility in

Baltimore, MD, they were able to install and run the script, and successfully receive and display the telemetry during the last two days of the CPX (19-20 April 2003).

(4) AFSERS-TENCAP simulated SAR imagery was illegible by TES-N. To simulate SAR imagery, AFSERS-TENCAP simply takes EO imagery and "degrades" its resolution using various techniques. Unfortunately, when the sim-SAR imagery was received in the TES-N Screener application, it was so dark as to be totally useless to the imagery screener analyst. Even when saved in TES-N's DBO, the many imagery manipulation tools in TES-N could not enhance the image to retrieve any type of useful visual information. The work-around was to have the simulated U-2 fly with an ASARS sensor (the only sensor type AFSERS-TENCAP could reliably simulate), and yet produce EO images (NWDC Facilitators had to ask the players to "pretend" they were seeing SAR, and therefore could "see through" the cloud cover that "forced" them in the first place to not use UAV EO video, but to use U-2 SAR imagery instead).

4. ELINT / ESM:

a. ACCOMPLISHMENTS: During both CPX and FTX, attempts were made to send simulated ELINT/ESM from various M&S sources to the Tactical Data Dissemination System (TDDS) Network Management Center (TNMC) in Washington, DC, to be put onto the TDDS broadcast, with receipt of the broadcast on BLR being via organic means, and processing of exercise/experiment ELINT done using the GALE software in TES-N. The various M&S ELINT/ESM sources and their success were:

(1) JQUAD (Camp Smith, HI) -- intended for CPX only; received successfully aboard BLR on fourth day of CPX (17 April 2003); used for TES-N MSEL events for two days until JSAF-ASSET transmissions were successfully received on BLR (19 April).

(2) JSAF-ASSET (NWDC Newport, RI) -- last two days of CPX, all of FTX.

(3) ISR UUV-CSIM (NUWC Newport, RI) -- never successful going direct to TNMC (see below), but were able to email draft TACELINT to ASSET operator in Simms Hall who would ingest into ASSET and sent to TNMC.

b. ISSUES/COMMENTS:

(1) BLR/C7F internal ELINT flow. For the first three days of the CPX, no exercise ELINT was received by any TT03/FBE-K afloat players. This fact by itself (never mind the reasons for it) was difficult to identify because of major ELINT connectivity issues within the lifelines of BLR (e.g., bad connectors, wiring missing between TRE and TES-N) that took experts from ship, staff, and NWDC/SPAWAR (Meana) the better part of ten days prior to STARTEX, and into the first day of CPX, to troubleshoot and correct.

(2) ASSET via TNMC. TNMC would not accept simulated ELINT injects from JSAF-ASSET at Newport until the last two days of CPX (19 April 2003) [unable to verify reason for this delay]. In the meantime, the Newport ASSET operator coordinated with the Camp Smith JQUAD operator to provide ELINT injects for the TES-N TST MSELs, which worked successfully.

(3) ISR UUV via TNMC. The problem was with permissions from TNMC, apparently because COMPACFLT never forwarded the CESR to TNMC FORAC, and because TNMC was comfortable with ASSET (having worked with it in many previous

exercises/experiments), but knew nothing of ISR UUV's CSIM -- TNMC undoubtedly wanted to avoid taking any risks, due to the real world use (e.g., Gulf War II) of the TDDS broadcast.

(4) GALE and ESM Lines-of-Bearing (LOBs). One of the specific reasons for using the ISR UUV simulation in FBE-K FTX was to see how TES-N's GALE software would process ESM LOBs of the sort most likely to be produced by an ISR UUV platform -- it apparently couldn't. Despite the presence of ELINT analytic/GALE operator expertise (both organic to C7F, and in the person of a Mobile Training Team {MTT} ELINT/GALE trainer), the TES-N GALE was unable to receive, process, and display TACELINT messages from ISR UUV that reported an LOB. These messages were apparently being received and processed by GCCS-M, as a number of LOBs were seen on the GCCS-M COP with the simulated ISR UUVs as the origin of the LOB. As a work-around, the NWDC Facilitators had the M&S operators in Newport send the TACELINTs as very thin, elongated ellipses -- so thin (semi-minor axis) that they would look like a single line on the display, with a center point around the simulated target producing the emission, and a length (semi-major axis) twice the length of the distance between the ISR UUV sensor and the simulated emitter, and oriented so that it looked like a line emanating from the ISR UUV's location and passing through and beyond the target.

5. COMINT:

a. ACCOMPLISHMENTS:

(1) CPX. In the CPX, COMINT injects were to be crafted by scripters from Kunia Regional SIGINT Operations Center (KRSOC) who were resident in the TT03 JECG at Camp Smith, HI. These injects would then be sent via the SI broadcast to BLR, and received by a COMINT analyst using a TES-N MFWS. What actually happened was the COMINT injects (once they got flowing) were received only on SCI GCCS-M, as that is the way the BLR SCI architecture was configured (see ISSUES/COMMENTS section below).

(2) FTX. In the FTX, the intention was to continue the participation of KRSOC scripters, and simply re-use their COMINT injects (with slight modifications as needed). Unfortunately, the KRSOC scripters could not stay for the FTX, and as a result the COMINT injects during FTX boiled down to the NWDC Facilitator (Sweitzer) crafting a GESNSER-level COMINT spot report (roughly based on the gist of the MSEL injects) using MS Outlook on an IT-21 machine in the BLR JIC, and emailing the report to as the "initial tipper" to the appropriate MSEL events.

b. ISSUES/COMMENTS:

(1) CPX COMINT injects. At CPX STARTEX, the KRSOC scripters were just arriving at the JECG, and it took several days to get set up, to work out procedures, and to have them provide enough detail for the COMINT injects to be of use as tippers to specific TST MSEL events. The COMINT analyst at the SCI GCCS-M would receive the injects as emails, print them off, and walk them (about 20-25 feet) over to where the TST team was manning their TES-N terminals. This only worked, without prompting from the NWDC Facilitators, on the last day of the CPX (20 April).

(2) No COMINT analysis tools in TES-N. The attempt to use the SCI side of TES-N was a total wash, as it turns out TES-N does not have any true COMINT analysis tools (as does SCI GCCS-M), other than allowing the viewing of SCI messages such as KLIEGLIGHTS or TACREPS, and the plotting of locational data on a map -- both of which SCI

GCCS-M already does (and in C7F cryptologists' view, does better). For this reason, C7F cryptologists (along with the rest of the Navy's cryptologic community -- at least according to the C7F Fleet Cryptologist) have chosen to not use TES-N for COMINT analysis. Consequently, none of the required connectivity (other than JWICS Intelink web-browsing access, and SCI-level chat) for using SCI TES-N was not in place for use during TT03/FBE-K. While attempts were made to effect this connectivity during TT03/FBE-K, the effort was seen by NWDC Facilitators and C7F personnel as being low priority compared to other issues being dealt with simultaneously (both in TT03/FBE-K and in the "real world"), so it never got done.

(3) TES-N ISSE Guard was non-functional on BLR. Part of the concept of using SCI TES-N for the COMINT analyst member of the TST team was to exercise use of the Information Support Server Environment Guard (ISSE) Guard to move appropriate data from the SCI side of TES-N to the GENSER side of TES-N in support of TST processes. Unfortunately, no BLR/C7F personnel, TES-N FSRs, or JFN Mobile Training Team (MTT) members knew anything about configuring or operating the ISSE Guard.

C. TES-N OUTPUTS.

1. Target nomination messages (ATI.ATRs) to ADOCS and to TST Target Folder Server:

a. ACCOMPLISHMENTS: The objective was for the TST nomination analyst to use TES-N to create a target nomination message (in USMTF "ATI.ATR" format), and to send that nomination message (via SMTP) to the ADOCS server on BLR, and to the TST Target Folder server at NWDC in Newport, RI. [ADOCS was set up so that it would not only receive the ATI.ATR from TES-N, but after parsing it would turn around another ATI.ATR to the TST Target Folder server -- so that the target folder for any given TES-N created TST nomination had both the ATI.ATR that come directly from TES-N, and the ATI.ATR that was "turned around" by ADOCS]. The first successful nomination output by TES-N as part of a TST MSEL event was accomplished on CPX day five (18 April 2003); the process worked for the last three days of CPX and the first day of FTX, was inoperative for three days, and then worked again for the last four days of the FTX.

b. ISSUES/COMMENTS:

(1) Nomination creation and sending. It took four days to rectify issues with SMTP across the various networks and systems (TES-N LAN, ship's LAN/Exchange server, FBE-K WAN and Exchange servers, ADOCS mail server) to first get TES-N's ATI.ATR messages to be received by ADOCS and the TST Target Folder server. In the case of the TST Target Folder server, access was impossible for the first three days of CPX TST MSEL events due to the FBE WAN being inoperable until CPX day four (17 April 2003). Once set up properly, no problems were encountered until FTX day two (26 April 2003) when the nominations began getting "stuck" in the TES-N outgoing message queue, and by the next day TES-N would not even allow the analyst creating the ATI.ATR to save it to the TES-N database, a prerequisite to sending the target nomination message out. The cause was determined by the FSRs to be corrupted files in the TES-N Cross-INT filter database (e.g., log files were over-filled), a problem that took approximately three days to troubleshoot and correct, during which time all target nominations were manually entered into ADOCS (e.g., "yellow-sticky" transfer from TES-N analysts to Targeting Officer sitting at ADOCS workstation in BLR JIC).

(2) Problems with parsing/formatting. Almost immediately after the first successful ATI.ATR output by TES-N, ADOCS users began complaining that the TES-N analysts were not giving the nominated targets a proper target identification (TGTD). Two days later (i.e., on the last day of CPX), inconsistencies were noticed in how the target nominations were being handled by ADOCS and how they were showing up in the TST Target Folder server. Not until late in the evening of FTX day five was controlled testing able to be done by the NWDC Facilitator (Sweitzer), during which fault was found in both TES-N and ADOCS. Part of the confusion was because the TES-N target nomination creation template allows the analyst to give the target an identification (e.g., type, equipment name, etc.) using either the "TST" or the "TGTD" lines, but not both. ADOCS, on the other hand, apparently only uses the "TGTD" line for target identification. For instance, when the TES-N ATI.ATR message used the "TST" line, ADOCS would "turn around" to the TST Target Folder server an ATI.ATR with no "TST" line and a blank "TGTD" line (e.g., "TGTD/-//-//"); whereas, if the TES-N message used the "TGTD" line, ADOCS would "turn around" an ATI.ATR with both a "TGTD" line (whose fields were out of order and truncated compared to the original ATI.ATR) and at "TST" line (containing the same fields as "TGTD" line). ADOCS also changed several other fields of other lines for no known reason, most notably the "DTG" line and field contents.

2. Images related to target nominations to PTW for aimpoint refinement:

a. ACCOMPLISHMENTS: The objective was for the TST nomination analyst to attach the image or several images (e.g., video "chips" showing the TST) to the outgoing target nomination, and send the nomination simultaneously to three places:

(1) to ADOCS to begin weapon-target paring and engagement processes;

(2) to the TST Target Folder server to either create a new target folder or update an existing target folder; and,

(3) to PTW to begin the aimpoint refinement process. It was known long before STARTEX, however, that the version of PTW used on BLR for TT03/FBE-K could not receive and parse ATI.ATR messages (i.e., did not have the DTMS software used in MC02/FBE-J). The work-around was supposed to be that the PTW operator would open the target folder (after it had been created in the TST Target Folder server by step (2) above) and pull down the images from there.

b. ISSUES/COMMENTS:

(1) TES-N does not allow images to be attached to outgoing ATI.ATRs. Even in TES-N version 5.0, analysts still cannot attach images to outgoing ATI.ATR messages. Consequently, all images captured, "chipped" and saved (as NITF) in TES-N had to be manually transferred (FTP) to PTW. The PTW operator would then pull up the images and conduct aimpoint refinement (only sometimes, due to manning constraints and base image quality issues -- see "M&S FEEDS INTO TES-N" section above), and then save the images (as both JPEG and NITF) to a shared directory on the BLR IT-21 LAN.

3. Images related to target nominations to TST Target Folder Server:

a. ACCOMPLISHMENTS: The objective was for the TST nomination analyst to attach the image or several images (e.g., video "chips" showing the TST) to the outgoing target nomination so that the TST Target Folder server could add the image(s) to the target folder for

that TST. Because even the new version 5.0 of TES-N software still cannot attach images to ATI.ATRs, the workaround for getting images into the TST target folders was for the NWDC Facilitator (Sweitzer), and later some of the players (once the were taught) would use MS Outlook on an IT-21 machine to manually create a one-line ATI.ATR email (using the "TNO" line only) with the subject line "Target", pull the image(s) from the shared directory and attach to the email, and send to the TST Target Folder server. The server would then parse the email, and use the "TNO" to update the correct target folder with both the ATI.ATR info and, more importantly, the images themselves.

b. ISSUES/COMMENTS:

(1) TST Target Folder server worked great. The NWDC TST Target Folder server application proved to be a simple but powerful prototype that was important to both the CPX and the FTX (though up until two weeks prior to STARTEX its role in CPX was still unknown). Its importance became clear when, mid-way through FTX, there was one brief period where the parser script stopped working properly -- and while it was rapidly and easily re-started, the level and swiftness of "protest" from the participants made clear it had become an important factor for them. Despite so many process artificialities, the players were able to see the value of a common, web-accessible repository for information and images related to any given TST, thereby hopefully preparing those aboard BLR for the program of record target folder application (Joint Targeting Toolbox) that was to be installed later this Spring.

4. TST location output to COP (i.e., Manual Contact to GCCS-M) for "tracking" and SA:

a. ACCOMPLISHMENTS: The objective was for the TST nomination analyst to not only create an ATI.ATR as above, but to then use TES-N's rudimentary interface to GCCS-M to input the target into the COP as a track, for the situational awareness of ALCON, and to assist (theoretically) in the "tracking" of the TST while waiting for it to be engaged.

b. ISSUES/COMMENTS:

(1) GCCS-M configuration on BLR was sub-optimal. The GCCS-M configuration on BLR had a wide variety of serious issues (e.g., different software versions from machine to machine), some of which took the entire event to straighten out. This effort impacted the TES-N to GCCS-M interface in that, even though

(2) TES-N output to GCCS-M was inoperative on BLR for CPX. Even with the new TES-N version 5.0, there was no improvement in TES-N's ability to output to GCCS-M from what was used in MC02/FBE-J. In fact, the capability did not exist until the NWDC Facilitators came aboard and showed the C7F staff how the creation of a "Manual Contact" in TES-N at the same location as the nominated TST (which was already in TES-N's Cross-INT database and was displayable using TES-N's Integrated Tactical Display [ITD] application) could then be set up to be sent periodically as a formatted message (OTH-Gold or XCTC) to GCCS-M's JOTS1. It took the entire CPX to focus enough time and energy to troubleshoot this interface and get it working. It worked for the first two days of FTX, and then suffered the same problem as the TES-N target nominations (i.e., nothing could be saved to the Cross-INT database) and was never able to be brought back up -- consequently, the GCCS-M "Red database analyst" was never able to become part of the process (e.g., changing the "hard-wired" TES-N-assigned track name to reflect the Target Block Number assigned to that TST by TES-N during the target nomination creation process).

(3) BOTTOM LINE: the TES-N output to GCCS-M only worked for two days at the same rudimentary and suboptimal level at which it was working for MC02/FBE-J; for the remainder of TT03/FBE-K it was functionally inoperative.

5. U-2 mission plan creation and output to AFSERS-TENCAP:

a. ACCOMPLISHMENTS: Because the Air Force (specifically JFACC Rear at Hickam AFB) was unable to create U-2 mission plans for TT03/FBE-K (citing real world commitments of their experts), and because the JFN Mobile Training Team members were delayed coming aboard (due to early BLR sortie from Guam for typhoon avoidance), NWDC Facilitator (Sweitzer) used a well-written help-tutorial on-line in TES-N's EMPS application to create a mission plan to output to AFSERS-TENCAP for its use in providing a simulated feed of U-2 imagery and telemetry back to TES-N. [Note: a U-2 mission plan, or "OP" in EMPS terminology, consists of a navigation plan and a collection plan built using a specific set of collection requirements for a specific sensor type, associated with a specific aircraft tail number, flying a specific track, downlinking to a specific ground station].

b. ISSUES/COMMENTS:

(1) EMPS uses different maps than ITD. One example of the "immaturity" of the internal integration between many of TES-N's applications is the fact that EMPS (Enhanced Mission Planning System) uses completely different maps than does ITD (Integrated Tactical Display). Not only does it load the maps from a different set of files, but the user interface (e.g., zoom, pan, etc.) is completely different (and very cumbersome). This made the process of mission plan creation even more difficult to learn, and was just another element that added to the delay in getting the U-2 simulation to work properly.

(2) AFSERS-TENCAP can only reliably simulate ASARS sensors. AFSERS-TENCAP could not ingest the initial U-2 mission plans built for the EO sensor packages (SYERS and SYERS 2). The AFSERS-TENCAP technician on board BLR said that, as far as he knew, AFSERS-TENCAP simulation only worked with the SAR sensors packages (ASARS, ASARS 2, and ASARS 2A). Finally, on the second to last day of CPX (19 April 2003, Patriots Day in Massachusetts), a U-2 ASARS 2 mission plan was successfully built in EMPS, output to and ingested by AFSERS-TENCAP, and "played back" into TES-N, with both telemetry and images (albeit EO and not SAR) being received and displayed properly by TES-N.

6. DIOP of U-2 imagery and telemetry to ISRM (CPX) and ESSEX RTC (FTX)

a. ACCOMPLISHMENTS: The objective in CPX was to have the U-2 simulation coming into TES-N from AFSERS-TENCAP "turned around" to the ISRM (Intelligence Surveillance Reconnaissance Manager -- which is in reality a TES RTC just re-named by USAF) at Hickam AFB using the TES-N Data Input/Output Port (DIOP). DIOP is a proprietary means of efficiently transferring the large amounts of data between "TES family" systems such as TES, TES-N, RTCs, and ISRM (as the TES-N training manual says, "DIOP allows real-time screening and exploitation of direct downlink tactical imagery by users without direct sensor access."). Doing the same to the TES-N RTC aboard USS ESSEX (ESX) during FTX had been discussed early in FBE planning, but had been considered cancelled due to real-world events -- in the end, ESX turned out to be available, and so DIOP was attempted (although somewhat "ex-scenario" as ESX had no other means of participation in the TST MSEL events). The DIOP connectivity between BLR, ISRM, and ESX RTC tested successfully before CPX

STARTEX using recorded mission tapes and demo files built from actual U-2 missions specifically to demonstrate and train the DIOP capability when no live U-2 was airborne and downlinking.

b. ISSUES/COMMENTS: AFSERS-TENCAP simulation stream cannot be "DIOP'd". On the last day of the CPX (20 April 2003), after a day of successful receipt into TES-N of simulated U-2 imagery and telemetry produced by AFSERS-TENCAP, the NWDC Facilitators asked the TES-N FSRs to attempt to DIOP the sim-U-2 feeds to ISRM at Hickam. This revealed that, because AFSERS-TENCAP uses different processes (FTP for imagery and UDP for telemetry) to provide the inputs to TES-N than a live U-2 (which would be sending it through the CDL-N and CIP), the AFSERS-TENCAP feeds could not be turned around using DIOP [unable to get further specifics as to why, but suspect it has to do with the custom script that had to be installed and run to receive AFSERS-TENCAP simulation in the first place -- see "M&S FEEDS TO TES-N" section above].

7. File transfer to ISRM (CPX) and ESSEX RTC / RTC Lites (FTX)

a. ACCOMPLISHMENTS: Because "DIOP" is only for the transfer of U-2 imagery that is being (or has just been) directly downlinked, other file types must be exchanged between TES-N and remotes like ISRM and RTCs using standard means such as FTP and SMTP. During FTX only, three RTC Lites were employed, one aboard the vSSN (virtual submarine simulator at NUWC, Newport, RI), one aboard the E2XV (Experimental Hawkeye-2003 surrogate van in the NWDC parking lot in Newport, RI), and one aboard the virtual DDX (at NSWC Dahlgren, VA).

b. ISSUES/COMMENTS:

(1) FTP and SMTP worked great. With the exception of the very first day of CPX when the ISRM at Hickam was not yet manned, all attempts to transfer files between TES-N and ISRM (in CPX) and ESX RTC (in FTX) by FTP or SMTP were successful.

(2) RTC Lites worked -- eventually. The RTC Lite at NUWC had been used in previous FBEs, and was fairly easy to get up and going. Configuring the other two RTC Lites was a difficult task to which little effort could be committed (due to their low priority relative to other issues that were consuming the FSRs' attentions). The vDDX RTC Lite began receiving exercise data on FTX day four (28 April 2003), and the E2XV RTC Lite on FTX day six (30 April 2003). The actual utility of these RTC Lites to those "virtual shooter" nodes remains indeterminate.

8. Cross-INT replication from TES-N to ISRM (CPX) and ESSEX RTC (FTX)

a. ACCOMPLISHMENTS: Replication of TES-N's Cross-INT database was attempted to both ISRM (CPX) and the ESX RTC (FTX), but with very limited success.

b. ISSUES/COMMENTS:

(1) During CPX, Cross-INT was not replicated to ISRM. Due to higher priority issues, replication between BLR TES-N and the ISRM at Hickam (which is for all practical purposes a TES RTC) was only attempted CPX day six, but was unsuccessful due to instability problems with ISRM.

(2) During FTX, Cross-INT was replicated to ESX RTC -- worked too well! Starting on FTX day two (not attempted on FTX day one), Cross-INT replication with ESX RTC was successful -- for two days. In fact, according the preliminary evaluation by the

TES-N FSRs on BLR, the large amounts of data "pulled" [NFI] by ESX RTC was probably the major contributor to the corruption of TES-N's Cross-INT filter database files that caused TES-N to be NMC (non-mission capable) for TST support during FTX days three and four. In order to assist with troubleshooting and ensure TES-N stability for the reminder of FTX, no further replication with ESX RTC was attempted. [Instead, TES-N analysts from ESSEX flew over to BLR for the last two days of FTX so they could take advantage of the presence of the JFN MTT and the M&S flows into TES-N].

(3) Target Nominations created in TES-N are not replicated to ISRM / RTC. This means Target Nominations created by TES-N have to be passed by some other means to ISRM / RTC. During CPX, target nominations were passed to JFACC Rear (Hickam AFB, HI) via chat; during FTX, target nominations were not passed at all the ESX RTC, as they were not "players" per se in the TST MSEL events.

D. OTHER.

1. GCCS-M COP Tracks into TES-N ITD.

a. ACCOMPLISHMENTS: In addition to TES-N's rudimentary capability to send "Manual Contacts" to GCCS-M, COP tracks can also be sent from GCCS-M to TES-N. The objective of attempting to do so in TT03/FBE-K was to provide a richer context of contacts, tracks, Blue ISR asset locations, etc. in TES-N for the analysts trying to "find and fix" TSTs.

b. ISSUES/COMMENTS:

(1) TES-N receipt of GCCS-M tracks had problems. During CPX, NWDC Facilitators were only able to make occasional, hasty checks (due to higher priority issues) on the status of GCCS-M tracks being received in TES-N. During each check, TES-N's incoming "Message and Data Log" showed a good number of incoming tracks from GCCS-M, but those tracks did not appear to be parsing into the TES-N ITD [unable to compare the number of tracks sent by GCCS-M to the number of those tracks successfully received by TES-N]. On the first day of the FTX, it was discovered that no GCCS-M tracks had been received in TES-N for the several day transition period between CPX and FTX. After a few hours the problem was rectified, and the tracks flowed as before for a day (but unable to be displayed on ITD), but then TES-N experienced the Cross-INT filter database file corruption problem (see above). After one more "down day," receipt of tracks was again restored, but still no ITD display capability. Finally, with four days left in the FTX, the GCCS-M tracks coming into TES-N were able to be brought up on the ITD; however, it was discovered that TES-N ITD did not display any track labels (see issue (2) directly following).

(2) TES-N ITD displayed GCCS-M track locations, but no labels. When GCCS-M tracks were brought up in TES-N's ITD, the tracks appeared in their proper locations (albeit using TES-N symbology which is based on MIL-STD-2525, and not with GCCS-M symbololgy) but the symbols do not have any labels associated with them (e.g., no track names), making them all but functionally useless to the TST team.

2. M&S simulated ISR asset display in GCCS-M COP.

a. ACCOMPLISHMENTS: By the end of FTX, all of the simulated Blue ISR assets active in M&S were simultaneously displayed on BLR's GCCS-M COP with appropriate labels (e.g., two ISR UUVs, two Predator UAVs, one U-2).

b. ISSUES/COMMENTS: This was the first time known to either NWDC Facilitator on BLR that this has happened in an FBE. The key enablers were very closely coordinated troubleshooting between the NWDC Facilitator (Meana), the FBE-K ATO builder (Specht), the M&S Director (Dial), and the GCCS-M Tech on BLR (DeMarco).

3. Live P-3C video downlink via CDL-N into TES-N [ex-scenario].

a. ACCOMPLISHMENTS: During the two weeks prior to TT03/FBE-K (on 5 April 2003), a VPU aircraft was able to spend the better part of a day within line-of-sight of BLR, specifically to test the live downlink of EO/IR video from the aircraft's new TCDL into TES-N using the ship's CDL-N antenna and CVIU (no NIU). With assistance from NWDC Facilitators (Meana in particular), and with remote contractor support by phone, sailors from BLR ships company and C7F staff were able to employ the lessons learned from four previous unsuccessful attempts to make this event successful.

b. ISSUES/COMMENTS: While this event was ex-scenario with regards to TT03/FBE-K it did several things that positively impacted TT03/FBE-K, including:

(1) testing the internal TES-N video path from video switch to MFWS;

(2) familiarizing TES-N analysts with the TES-N video screening and frame capture tools (as well as the quality of live video, with which they could contrast simulated video);

(3) helping to solidify the NWDC Facilitators as "part of the team".

Lessons Learned

A. "What would you have done differently with 20/20 hindsight?" From the technical perspective, almost nothing -- almost all "lessons TO BE learned" are in the areas of FBE conduct, Fleet "ownership" and involvement, etc.

B. "What did we learn by employing this technology?"

1. Learned once again that TES-N is a complex and developmentally immature system whose strength/weakness are directly related to the strengths/weaknesses of its interfaces with communications, with other JFN systems, and with ADOCS.

2. Learned once again that getting TES-N and the rest of the JFN equipment and its many intricate interfaces to really "work" (fully mission capable) requires the regular (daily?) attention of a wide range of cooperating technicians and system operators, both on board and off board, using scripted scenarios (if not live downlink events) to force issues to surface that would never appear in mere system demonstrations or static testing.

C. "What did we learn from the issues that were encountered?" The answer to this will not be truly known until the next such experimentation event involving TES-N / JFN.

Recommendations

A. Continue to improve quality of M&S video and imagery (e.g., 1-meter base), and platform / sensor / feed characteristics (particularly simulation of U-2 products).

B. Thoroughly test TES-N to ADOCS target nomination interface prior to event STARTEX, including a close examination of how individual data fields are handled through the whole process.

C. Continue attempts to incorporate program-of-record digital target folder solution (e.g., Joint Targeting Toolbox, based on MIDB) into future ISR / TST experimentation events.

D. Clarify division of labor (and increase frequency of joint planning sessions) between:
- Functional leads
- IKA team
- Technical team

E. Assign COP ownership and explicitly state roles and responsibilities (of above three, plus players)

F. Document Control (a la "TEP")
- publish schedule ("spirals") for document inputs
- larger issue than just tech team (should be FBE-wide -- IKA lead?)

G. Produce "Functional Flow Diagrams" (FFDs?) before technical-level OSDs

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Appendix D FBE-K SEA-STRIKE OBSERVATIONS: ISR AND JFN

This Appendix was provided by Wayne "Doc" Sweitzer of Titan Corporation

1. What follows are observations of the FBE-K ISR Planner made during the planning and execution of the Sea Strike portion of TT03/FBE-K.

2. DISCLAIMER: This document may appear to "list" toward negative, as it is meant to be the author's frank professional opinions and recommendations as to where future FBEs might be improved, and not a list of accomplishments. These observations are based on direct, personal experience in FBE-K, and in numerous previous FBEs. Nothing herein is intended to suggest fault or assign blame. The observations are strictly those of the author, and should not be construed as the official position, in whole or in part, of the Navy Warfare Development Command or Titan Corporation.

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SECTION 1: BACKGROUND.

1.1 Fleet Battle Experiment - Kilo (FBE-K) was conducted during April-May 2003 in concert with Exercise Tandem Thrust 2003 (TT03). The Officer Conducting the Exercise (OCE) was Commander, United States Seventh Fleet (C7F), with Navy Warfare Development Command (NWDC) as the primary organization coordinating FBE-K, and the Joint Warfighting Center (JWFC) as the primary organization coordinating TT03.

1.2 TT03/FBE-K took place in two major phases: a Command Post Exercise (CPX), followed by a Field Training Exercise (FTX).

1.2.1 During CPX, the C7F Staff was being evaluated by JWFC for its ability to perform the role of an afloat Commander, Joint Task Force (CJTF). FBE-K Sea Strike ISR/JFN play was limited to connectivity and interface testing, and basic Time Sensitive Targeting (TST) process walk-throughs with essentially one full-time C7F Staff member.

1.2.2 During FTX, NWDC (the Sea Strike team in particular) was tasked to help C7F conduct basic Time Sensitive Targeting (TST) processes using the Joint Fires Network (JFN) and the Army Deep Operations Coordination System (ADOCS).

1.3 During FBE-K, the Joint Fires Network (JFN) was considered by NWDC to be comprised of three major subsystems:

1.3.1 Tactical Exploitation System - Navy (TES-N), with applications / subsystems including (but not limited to):

- Geographic Area Limitation Environment (GALE);
- Enhanced Mission Planning System (EMPS);
- Integrated Tactical Display (ITD);
- Remote Terminal Capability (RTC);
- Remote Terminal Capability - Lite (RTC-Lite).

1.3.2 Global Command and Control System - Maritime (GCCS-M);

1.3.3 Joint Service Imagery Processing System - Navy (JSIPS-N), with applications / subsystems including (but not limited to):

- Precision Targeting Workstation (PTW);
- Image Product Library (IPL);
- Joint Concentrator Architecture (JCA).

1.4 FBE-K events involving Sea Strike ISR and JFN were primarily conducted aboard USS BLUE RIDGE (LCC-19) at sea off the Northern Mariana Islands (including Guam, Rota, Tinian, Saipan). Other involved nodes included: the Modeling and Simulation (M&S) laboratory at NWDC in Newport, RI, with a virtual E2X (E2XV) van parked just outside; the virtual SSN and ISR Unmanned Underwater Vehicle (ISR UUV) M&S at the Naval Undersea Warfare Command (NUWC), Newport, RI; the virtual DDX (vDDX) M&S at Dahlgren, VA; a virtual ANZAC ship at Fern Hill, Australia; a JFACC Rear (CPX only) at Hickam AFB, HI; and USS ESSEX (LHD-2).

SECTION 2: FBE PLANNING, ORGANIZATION, AND EXECUTION OBSERVATIONS.

2.1 Continuity Between Concept Development and Experiment Implementation.

Observation: A lack of continuity existed between the development of FBE-K concepts/initiatives involving ISR/JFN, and the actual FBE-K planning/implementation. Among other things, this discontinuity hampered the development of meaningful analytic questions, and the experimental techniques to help answer those questions.

Discussion: By the time the FBE-K ISR Planner was brought aboard, there was no one available who could articulate the original thinking behind the general concepts and initiatives involving ISR and JFN that had been dictated for use during FBE-K (e.g.**:** "Pervasive sensing...from large numbers of heterogeneous, widely distributed sensors"; "Dynamic management of a tiered UAV architecture"; etc.). And because the FBE-K ISR Planner had not

been part of the original concept and initiative development process, the planning and implementation of an experiment (or more accurately, a component of a larger experiment inherently rife with its own constraints -- see Attachment A) that would meaningfully advance those concepts as originally intended was for all practical purposes impossible. Development of "analysis questions" was particularly problematic, as the thinkers who came up with the concepts and initiatives were not there to help define the details of what it was they were intending to subject to experimentation.

Recommendation: Those involved in the development of experimental concepts and initiatives must remain fully engaged throughout the FBE planning process, if not also during the execution and after-action analysis, to ensure the FBE is properly focused on addressing the original intent of those concepts and initiatives.

2.2 Staff Participation; Fleet Training vs. Experimentation.

Observation: From the ISR perspective, FBE-K degenerated almost completely into a JFN systems training event, largely because participation by C7F Staff and Fleet forces in the planning, preparation, and execution was constrained to such an extent as to preclude meaningful ISR and JFN-related experimentation.

Discussion: Fleet Battle Experiments have been wedded to Numbered Fleet participation from their inception, sometimes more successfully than at other times. FBE-K was clearly one of the "other times", at least in the areas of ISR and JFN. A major reason for this was the limited C7F Staff and Fleet participation evident during all of the major FBE planning conferences (and most TT03 planning meetings as well), where only one intelligence planner and no operations planners were available to participate in ISR and JFN-related working groups.

The lack of participation by Staff and Fleet operations personnel (N3) was particularly detrimental as, without operations, the intelligence (N2) portions of ISR and JFN are all but meaningless (i.e., the proverbial "self-licking ice cream cone"). The limits of C7F staff participation were most obvious during FBE-K execution when the only non-N2 C7F staff "players" in ISR and JFN-related events were the civilian Science Advisor and two Navy Lieutenants (one of whom was for all practical purposes available only part-time). Certainly the travel distances and time zones separating NWDC planners and C7F Staff exacerbated the difficulties during planning, as did concurrent C7F staff requirements to plan for both upcoming exercises and "real world" contingencies. While the constraints were obvious and largely understandable, the fact remains that the limited C7F staff participation precluded any meaningful ISR and JFN-related experimentation during FBE-K.

In fact, the only thing in the ISR/JFN initiative that was truly "experimental" was the inclusion of the ISR UUV simulation in the FTX MSEL events. The employment of the two simulated ISR UUVs from the vSSN at NUWC forced an initial level of interaction between the ASW and Sea Strike initiatives, and more importantly exposed some key Fleet players to this emerging technology.

Other than the ISR UUV experimentation, the event degenerated into what amounted to an extended JFN training opportunity for junior C7F N2 personnel (Navy Lieutenant and below). The training was conducted aboard USS BLUE RIDGE (LCC-19) by two "Facilitators"

supporting NWDC (specifically, a SPAWAR civilian and this author), backed by an extensive and expensive infrastructure of technical, modeling and simulation, and experiment control personnel and systems.

A JFN Mobile Training Team (MTT) was supposed to be available to help with TES-N training during the FBE, but they did not make it aboard until FTX. Once aboard, they did provide useful assistance, but by then most of the TES-N operators were proficient enough to not require further assistance to accomplish what was required during this FBE.

While the event was no doubt helpful to C7F, and even in certain ways to NWDC, it is highly questionable as to whether Fleet training is an appropriate role for NWDC, never mind consideration of the return on investment made.

Recommendation: Ensure ISR and JFN related experimentation involving a Numbered Fleet has full buy-in and participation of that Numbered Fleet staff, particularly the operations (N3) staff. Be prepared to postpone or cancel experimentation events that are dependent on Numbered Fleet staff participation as soon as it becomes obvious that the bulk of that staff's focus will and should be elsewhere other than on experimentation. And focus experiments on experimentation, and not on Fleet training / exercises.

2.3 NWDC Division of Labor and FBE "Supporting Services".

Observation: FBE-K experienced some of the same difficulties with intra-NWDC organizational challenges and "division of labor" issues as past FBEs. While these were decidedly not "showstoppers" in FBE-K, future FBE planning and execution could be significantly enhanced by their rectification.

Discussion: The FBE planning and execution tasks of the Functional Leads, the IKA Team, and the Technical Team each have significant overlaps that need to be more clearly addressed and delineated. While personal cooperation and teamwork ultimately "win the day" and make things work in the end, the road to getting there could stand some smoothing and straightening in a number of areas.

One of the more difficult FBE organizational challenges is the fact that the Technical Team does not work directly for the Maritime Battle Center, and so is only nominally under the control of the FBE Director. This naturally leads to occasional difficulties in areas such as: prioritization of resources such as technical expertise and finances; "taskings" from the Technical Team (e.g., to cover meetings, to provide documentation by certain deadlines) that can be in conflict with where the Functional Leads are headed when; and other challenges that sometimes leave the impression that the technical "tail" is wagging the functional "dog" (and to be fair, often times the "tail" if forced to do so, because the functional "dogs" are not fully prepared to provide requirements in the detail needed on the technical side to make architectural and resource decisions required by fast-approaching deadlines/"lead times").

A second challenge is the fact that IKA is viewed as a separate FBE functional initiative, akin to ISR/Fires, ASW, AADC, IO, etc., when in fact a great deal of what IKA should be involved in during FBEs is the information/knowledge management "layer" between the functional initiatives and the Technical Team's network services. It would be helpful in future FBEs to make a clear distinction between IKA functional initiatives, and the "I/KM services"

(e.g., websites, collaboration tools, document control, etc.) supporting the other functional initiatives -- and more importantly, who is responsible to whom for what.

Similarly, there are other FBE "supporting services" that too often get overlooked and/or taken for granted as "going to be there" (e.g., COP, intelligence/ISR, OPFOR, maps and charts, etc.), and as a result sometimes get less attention than needed, or sometimes fall through the cracks entirely. For instance, who is responsible (between Functional Leads, IKA Team, and Technical Team) for obtaining the correct maps and charts (softcopy and otherwise) and ensuring distribution to, and installation for, all who need them? Who is responsible for what aspects (e.g., obtaining, installing, maintaining) of underlying databases such as DPPDB and MIDB? Who is the FBE Lead responsible for "OPFOR" and Red Cell?

Fortunately, because FBE-K was dramatically reduced from its original scope, many of these issues never reached their "full potential" as FBE challenges (although some still did). Without early clarification of these roles and responsibilities, future FBEs could be much more significantly impacted.

Recommendation: Provide greater clarity on intra-NWDC "division of labor" for all the various aspects of FBE planning and execution. Explicitly identify "supporting services" (such as information/knowledge management and COP/database maintenance) that are above the strictly technical level, but are distinct from any "supported" functional/experimental initiatives. Assign appropriate roles, responsibilities, and resources to address each of these services.

2.4 Document Control.

Observation: Like most previous FBEs, FBE-K suffered from a lack of document control for most of the key coordinating documents.

Discussion: FBE planning (and sometimes execution) is too often hampered by a lack of "command and control" over key planning and coordination documents. These documents include (but are not limited to):

- the "official" FBE overview brief;
- manning spreadsheet;
- master SOE / MSEL list;
- participating live forces list;
- orders of battle (blue, red, white), both simulated and live;
- operational sequence diagrams (OSDs);
- the Conolidated Exercise Support Request (CESR).

FBEs by their nature involve personnel located all over the country, and sometimes literally around the globe, placing even greater importance on the need to keep all planners working from the same "sheets of music" (to adapt the well-worn analogy). Symptoms caused by loose document control that have been experienced first hand (and otherwise) in past FBEs have included, but are not limited to:

- confusion resulting from failure to identify key FBE documents, and assign explicit "ownership" responsibility for each document;
- lack of participation by intended document contributors, often due to the document "owner" not making the roles & responsibilities of contributors clear;

- duplication of effort (e.g., two or three authors producing essentially the same documentation concurrently);
- man-hours wasted editing old versions of documents, only to find out later the edits are O.B.E.;
- limited accessibility to the "most current version" of key documents, and/or limited visibility into what the "most current version number" is at any given time.

The major notable exception during FBE-K (and FBE-J before it) was the Technical Engineering Plan (TEP), the "C2" of which should be used as a model for future control of all major FBE documents, with perhaps some improvement in visibility into the "most current version number" (for example, via a listing of "the latest" document version numbers posted on a well-maintained web site).

Recommendation: Early in the FBE planning stages, identify key coordinating documents (and their owners), and implement an FBE-wide common methodology for the cooperative production, review, maintenance and accessibility of those documents -- while at the same time keeping this "FBE document control" methodology / system as accessible, flexible, and non-burdensome as possible.

2.5 Live Forces, ISR Assets, OPFOR, Emitters, and Fires.

Observation: As advanced as today's M&S is, it is no substitute for the incorporation of live forces and live operations into Fleet Battle Experiments.

Discussion: Despite the second half of TT03/FBE-K being called a "Field Training Exercise" (FTX), there were no live forces or emitters of any kind used for the FBE-K ISR/JFN TST events. This was not by design, by any means, but rather became a forced constraint based on the realities of world events (such as "Gulf War II") and other forces outside the control of NWDC planners.

With NWDC's extensive M&S operations, FBE-K TST "players" were able to learn and exercise many of the basic processes and information flows involved in TST. The simulation, however, would NOT have been sufficient to support any of the more complex TST and supporting intelligence processes had they been attempted, processes such as intelligence preparation of the battlespace (IPB), collateral damage estimation, targeting of precise weapons, and battle damage assessment (BDA).

In addition, current M&S state-of-the-art simply cannot simulate the myriad "devil's-in-the-details" type factors experienced in live-fly, live-OPFOR, and live-fire environments. This is primarily due to the complexities of human interactions with other humans (e.g., the complex interactions it takes for something as "simple" as the aircrew of a P-3 conducting ISR collection to coordinate with the analysts aboard the ship receiving the direct downlink of their video), and with their environment (both physical, technical, cultural/morale, etc.).

While today's M&S is good for many types of focused, limited objective experimentation (e.g., when controlling almost all variables and adjusting only a few to compare results), it generally by itself does not provide as good an environment as when live forces and operations are incorporated for experimenting with new military CONOPS and TTP where human

interactions (e.g., analysis, decision-making, and enemy actions and reactions) and environmental factors are significant determinants of whether those CONOPS and TTP are of value or not.

This is particularly true in the areas of ISR and targeting where so many of the processes are analytic in nature. The "target" of the analysis has to be as complex (e.g., active/reactive OPFOR trying to remain ellusive) and as subjected to the environment (e.g., obscured by weather or terrain) as in "real life". The inverse relationship of "time to analyze" vs. "quality of analysis" is perhaps the single most difficult issue faced in ISR and targeting, particularly in support of activities such as time sensitive targeting; the only way to get at this relationship in a meaningful way is to provide the level of fidelity inherent in the use of live forces.

Recommendation: Conduct all future ISR, targeting, and JFN-related experimentation with as many live forces (including live OPFOR) as possible to increase the fidelity of the experiment to a level that includes as many of the "truly hard" analytic processes as possible.

SECTION 3: FBE TECHNICAL AND SYSTEMS OBSERVATIONS.

3.1 Operational Sequence Diagrams.

Observation: Functional Flow Diagrams (FFDs) should be developed prior to (or in conjunction with) Operational Sequence Diagrams (OSDs).

Discussion: One type of document that has been a key part of FBE planning is the Operational Sequence Diagram (OSD), a graphical depiction of what computer systems are supposed to have what data/message types flow between them over what communications/network paths in what order for any given event during the FBE. While OSDs are extremely useful for showing the "what, where, when, and how" of FBE data and information flow, they do not adequately address the questions of "who" and "why" without which the OSDs are moot.

During FBE-K, the ISR UUV team at NUWC developed a series of what amounted to functional flow diagrams (see Attachment B) that gave the rationale behind the technical OSD that was in turn being developed to show how the vSSN / ISR UUV simulations would be connected to the rest of the NWDC M&S and C4I architecture. Their functional flow diagrams (FFDs) not only laid out the "who" and "why" to help the FBE Technical Team, but they also greatly facilitated the development of MSEL events and related aspects of FBE-K planning.

Development of FFDs for all initiative areas would go a long way to ensuring that the supporting OSDs have a reasoned, functional underpinning. This underpinning is important to ensuring the technical architecture optimally supports the experimental objectives, and because the OSDs inevitably translate into the expenditure of FBE resources (e.g.: financial; technical expertise; systems, networks, and communications; OSD testing; training; etc.)

Recommendation: For subsequent FBEs (and other experimentation events), FFDs should be institutionalized as required documents for all initiatives, to describe who at which functional nodes need (or will provide) what information from (to) whom and why. The OSDs

should subsequently (or concurrently) be developed as the technical reflection of those FFDs.

3.2 Common Operational Picture (COP).

Observation: The COP in FBE-K did not have explicit "ownership" by any initiative, and was not maintained to a level required to support ISR and JFN in support of TST.

Discussion: The COP was not made an explicit part of any FBE-K initiative, despite the fact that an accurate, stable COP is foundational to most (if not all) of them. The COP "ownership" remained unclear in FBE-K (as it did in FBE-J), most likely because the COP is common to all initiatives, and because it inherently requires the relentless attention of a broad range of analysts and technicians, all operating at several different levels.

There are technicians who must establish and maintain the COP engine(s) and the CST services at major nodes. There is a wide a variety of technical and analytic feeds into the COP, each of which has to be made explicitly responsible for providing quality, timely data (e.g., TDDS filters, Link inputs, Space/Missile events, weather, etc.). There are COP analysts of varying disciplines (e.g., ISs, OSs, CTs, AGs) who must provide quality assurance (QA) for their particular "piece(s)" of the COP (e.g., red tracks, blue tracks, air tracks, subsurface tracks, filters/alerts, etc.), and the databases associated with/supporting the COP (maps/charts/overlays, EOB, MIDB, imagery catalogs).

Without the explicit involvement and coordination of all (or at least most) of these analysts and technicians, the COP will be of such a poor quality as to be largely ignored. Despite FBE-K being the first FBE to have a successful display of all Blue ISR assets in COP with appropriate labels, the COP in general was rudderless, and was all but useless to ISR and JFN in support of TST.

Recommendation: Early in the FBE planning stages, identify who has responsibility for each of the many complex, interdependent functions that go into producing an accurate, stable COP from which players will be capable of "fighting the experiment" (instead of fighting with the COP). Consider doing the same with other "foundational" FBE processes, depending on the nature of the experiment.

3.3 Tactical Exploitation System - Navy.

Observation: FBE-K reconfirmed that TES-N has a number of powerful tools (some of which are unique to TES-N) that potentially could be of great use to Naval forces involved in Time Sensitive Targeting (TST). Unfortunately, FBE-K also reconfirmed that TES-N remains a very complex and developmentally immature system, with extremely limited interfaces to other C4I systems that are critical to TST, in particular GCCS-M and ADOCS.

Discussion: TES-N was used in FBE-K to support TST events, along with the other two major components of the Joint Fires Network (JFN), namely GCCS-M and JSIPS-N. The major inputs to TES-N during FBE-K were from a variety of M&S systems providing simulated ELINT, COMINT, ISR video, national imagery, and U-2 imagery and platform/sensor telemetry.

TES-N was also supposed to receive track data from GCCS-M, but this capability was functionally unusable due to the fact that TES-N does not provide any on-screen labeling of the symbols/icons used to display GCCS-M tracks.

The TES-N video display and capture application was generally reliable, but has a strange software bug in that the user's video control icons (e.g., start, stop, capture, etc.) do not display upon initially opening the window until the user moves the cursor over that area in the window (i.e., on the border between the video frame itself and the upper edge of the window). Also, the internal handling of video in TES-N degrades the signal such that, by the time the video was displayed on the TES-N Multi-Function Workstation (MFWS), the quality of the video simulation was barely useable for the purposes of having TES-N users "go through the motions" of Time Sensitive Target (TST) detection and identification. For instance, the NWDC Facilitators on BLR would often have to go to another space on BLR to read the latitude/longitude readout on the video remote server screen, as those same numbers were illegible on the TES-N screen. As in MC02/FBE-J, TES-N could not do any parsing or processing of the telemetry data provided by the ISR video platform M&S system other than display it, on-screen, "burned in" as part of the video images themselves. This resulted in the manual entry of data, particularly latitude/longitude, into the TES-N target nomination creation template, significantly increasing both the time required, and the risk of data entry errors.

The attempt to use the SCI side of TES-N during FBE-K revealed that TES-N does not have any true COMINT analysis tools (as does SCI GCCS-M), other than allowing the viewing of SCI messages such as KLIEGLIGHTS or TACREPS, and the plotting of locational data on a map -- both of which SCI GCCS-M already does (and in C7F cryptologists' view, does better). For this reason, C7F cryptologists (along with the rest of the Navy's cryptologic community -- at least according to the C7F Fleet Cryptologist) have chosen to not use TES-N for COMINT analysis. Consequently, none of the required connectivity (other than JWICS Intelink web-browsing access, and SCI-level chat) for using SCI TES-N was not in place for use during TT03/FBE-K. While attempts were made to effect this connectivity during TT03/FBE-K, the effort was seen by NWDC Facilitators and C7F personnel as being low priority compared to other issues being dealt with simultaneously (both in TT03/FBE-K and in the "real world"), so it never got done. Furthermore, a key part of the concept of using SCI TES-N for the COMINT analyst member of the TST team was to exercise use of the Information Support Server Environment Guard (ISSE) Guard to move appropriate data from the SCI side of TES-N to the GENSER side of TES-N in support of TST processes. Unfortunately, no BLR/C7F personnel, TES-N FSRs, or JFN Mobile Training Team (MTT) members knew anything about configuring or operating the ISSE Guard.

TES-N's primary output was supposed to be automated TST target nominations (USMTF messages in ATI.ATR format) to four places: (1) to GCCS-M to update the situational awareness (SA); (2) to JSIPS-N's PTW, with relevant imagery attached, for image analysis and aimpoint generation; (3) to a prototype web-based TST Target Folder server (set up for the FBE at NWDC) again with relevant imagery attached; and, (4) to ADOCS to begin engagement processes such as weapon-target pairing.

Almost immediately after the first successful ATI.ATR output by TES-N (four days into the FBE's CPX), ADOCS users began complaining that the TES-N analysts were not giving the nominated targets a proper target identification (TGTD). Two days later (i.e., on the last day of CPX), inconsistencies were noticed in how the target nominations were being handled by

ADOCS and how they were showing up in the TST Target Folder server. Not until late in the evening of FTX day five was controlled testing able to be done by the NWDC Facilitator, during which fault was found in both TES-N and ADOCS. Part of the confusion was because the TES-N target nomination creation template allows the analyst to give the target an identification (e.g., type, equipment name, etc.) using either the "TST" or the "TGTD" lines, but not both. ADOCS, on the other hand, apparently only uses the "TGTD" line for target identification. For instance, when the TES-N ATI.ATR message used the "TST" line, ADOCS would "turn around" to the TST Target Folder server an ATI.ATR with no "TST" line and a blank "TGTD" line (e.g., "TGTD/-///-//"); whereas, if the TES-N message used the "TGTD" line, ADOCS would "turn around" an ATI.ATR with both a "TGTD" line (whose fields were out of order and truncated compared to the original ATI.ATR) and at "TST" line (containing the same fields as "TGTD" line). ADOCS also changed several other fields of other lines for no known reason, most notably the "DTG" line and field contents.

Even in TES-N version 5.0 (the version used in FBE-K), analysts faced the same problem encountered in FBE-J in that they could not attach images to outgoing ATI.ATR messages. Consequently, all images captured, "chipped" and saved (as NITF) in TES-N had to be manually transferred (FTP) to PTW. The PTW operator would then pull up the images and conduct aimpoint refinement (only sometimes, due to manning constraints and base image quality issues -- see "M&S FEEDS INTO TES-N" section above), and then save the images (as both JPEG and NITF) to a shared directory on the BLR IT-21 LAN. The workaround for getting images into the TST target folders was for the NWDC Facilitator, and later some of the players (once the were taught) to use MS Outlook on an IT-21 machine to manually create a one-line ATI.ATR email (using the "TNO" line only) with the subject line "Target", pull the image(s) from the shared directory and attach to the email, and then send the email and attached images to the TST Target Folder server. The server would then parse the email, and use the "TNO" to update the correct target folder with both the ATI.ATR info and, more importantly, the images themselves.

Similarly, TES-N version 5.0 brought no improvement in TES-N's ability to output to GCCS-M from what was used in MC02/FBE-J. In fact, the capability did not exist on BLR until the NWDC Facilitators came aboard and showed the C7F staff how the creation of a "Manual Contact" in TES-N at the same location as the nominated TST (which was already in TES-N's Cross-INT database and was displayable using TES-N's Integrated Tactical Display [ITD] application) could be set up to be sent periodically as a formatted message (OTH-Gold or XCTC) to GCCS-M's JOTS1. It took the entire CPX to focus enough time and energy to troubleshoot this interface and get it working. It worked for the first two days of FTX, and then suffered the same problem as the TES-N target nominations when TES-N "crashed" for a few days (i.e., nothing could be saved to the Cross-INT database) and was never able to be brought back up -- consequently, the GCCS-M "Red database analyst" was never able to become part of the TST process (e.g., changing the "hard-wired" TES-N-assigned track name to reflect the Target Block Number assigned to that TST by TES-N during the target nomination creation process). Bottom line: the TES-N output to GCCS-M only worked for two days at the same rudimentary and suboptimal level at which it was working for MC02/FBE-J; for the remainder of TT03/FBE-K it was functionally inoperative.

See Attachments C and D for a more detailed treatment, and for additional issues.

Recommendation: Don't use TES-N in any further TST-related experimentation until

major advances are made to at least the following: (1) interface with ADOCS; (2) interface with GCCS-M; (3) interface to PTW and any external target folder applications (e.g., attachment of image chips to ATI.ATR messages); (4) handling of ISR video and platform/sensor telemetry; and, (5) SCI COMINT analysis tools, and SCI-to-GENSER connectivity via ISSE Guard.

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Appendix E FBE-Kilo OBSERVATIONS - FIRES PLANNER

This Appendix was provided by Steve Wood of Booze, Allen, Hamilton Corporation

SECTION 1: FBE KILO AND FBE KILO SEA STRIKE OPERATIONAL PLANNING OBSERVATIONS.

1.1 Planning Directive

Observation: No experiment directive was published for this FBE.

Discussion: In the past, experiment directives (in message format) have been used to codify and document the responsibilities of various NWDC, the numbered fleet, and the various DON agencies (both operational forces and shore establishment). Published by CCFC in coordination with NWDC and the numbered fleet participating in the FBE, its is a rosseta stone of information that outlines responsibilities, functions, and path toward execution of the experiment event. The lack of this document can cloud fleet numbered responsibilities and makes "arrangements" for support non-binding and unofficial.

Recommendation: Use this instrument in every FBE and LOE that is conducted.

1.2 Forward FBEs and NWDC Fleet Presence

Observation: Forward presence by the NWDC staff and key planners was lacking.

Discussion: Forward fleets require constant attention during the FBE planning process. During FBE Kilo, uniformed initiative leads were present at the forward fleet toward the end of the planning process, but many of the other key planners did not interact with the fleet on a substantial basis until they arrived for execution of the experiment. One way to foster this is through conduct of the FPC at the hosting numbered fleet location.

Recommendation: Attempt to get key planners forward often in the planning process and ALWAYS hold the Final Planning Conference at the forward numbered fleet home location. This will leverage fleet interaction and participation.

1.3 Fleet Interface and Fleet Initiative Sponsors

Observation: No uniformed numbered fleet sponsor (uniformed warfighter) for the Sea Strike Initiatives was identified or utilized.

Discussion: The Sea Strike Initiatives did not have substantive uniformed numbered fleet representation throughout FBE Kilo (planning and execution). Not having warfighter sponsorship at the numbered fleet level for FBE initiatives that focus on the application of sensors and weapons on high value emergent targets is unacceptable.

Recommendation: Use the experiment directive to outline the fleet sponsorship requirement and don't examine initiatives that have no uniformed sponsorship within the numbered fleet staff.

1.4 Technical versus Operational Initiatives

Observation: Many modeling and simulation (DDX ANGUSS, DISCOVERY MACHINE, WALTS) initiatives that were never part of the overall experiment plan (integrated, briefed or otherwise) impacted experiment execution.

Discussion: While many of these diversions could have been worked into the operational experiment plan, they were not. This caused friction during execution was not supporting of the Sea Strike Initiatives as briefed and approved by the FBE director.

Recommendation: Identify ALL initiatives up front and make sure they are part of the experiment plan. Include the TEP (Technical Engineering Plan) as a supporting potion experiment plan rather than as a standalone document. The Explan needs to codify ALL initiatives that are being undertaken and work to integrate those efforts.

SECTION 2: FBE KILO AND FBE KILO SEA STRIKE OPERATIONAL EXECUTION OBSERVATIONS.

2.1 Training

Observation: No window for training users (fleet or reserve force) on the experimental C4I (xC4I) systems used in the FBE.

Discussion: In the last couple of FBEs, this was accomplished in spiral events. There was no such event in FBE Kilo. This lead to several days of training during experiment execution, resulting in the loss of experiment process analysis time.

Recommendation: Build spiral events or dedicated FBE training windows into the schedule. Publish that schedule and those placeholders in the experiment directive.

2.2 IKA Support

Observation: IKA support to the FBE was minimized due to MBC participation in the 2nd Fleet LOE. There was no coordinated IKA support for FBE execution. (A web portal that participants can post to in NOT IKA.)

Discussion: No IKA lead planning or execution support for the FBE was responsible for many delays and training problems. Adhoc / initiative level IKA measures had to be implemented on the fly to support FBE execution. To exacerbate this matter, no clear level of IKA support was ever articulated to the planners in light of this during the planning process.

Recommendation: Identify IKA (or other initiative area) participation level in FBE and ensure that it is maintained.

2.3 Reserve Support Utilization

Observation: Many reservists were utilized in FBE Kilo to facilitate execution.

Discussion: This was a bright spot. Reserve personnel were plentiful, well coordinated and

quite supportive to the FBE effort. This was the best coordinated reserve support effort in an FBE to date.

Recommendation: Continue to work with the reserve forces at the level reached in FBE kilo to support future FBEs

2.4 Fleet Execution Support

Observation: Numbered fleet staff support was abysmal for the Sea Strike Initiatives. Support was limited to a civilian science adviser and two junior officers. This extended to JIC support for JFN manning during the CPX. (1 E-6). The promised JFACC support was also minimal (3 junior officers) and not what had been planned for.

Discussion: This lack of support in all these area was the largest single factor in not realizing the experimental potential of the Sea Strike efforts in FBE Kilo. This could be seen during the planning process but was not corrected by the MBC uniformed staff.

Recommendation: Early and frequent interaction with the UNIFORMED staff at the ACOS level is required for ALL initiatives in an FBE, especially one held within a forward numbered fleet.

2.5 Execution Timeline

Observation: The Sea Strike initiatives covered to long a period. (24 days)

Discussion: It is impossible to coop a numbered fleet staff for this period of time to conduct an experiment and still get a proper level of focus from that staff. Executing FBE events over a period this long leads to complacency and lack of desire to continue on the part of the participants. This lesson had already been learned in FBE Juliet.

Recommendation: Limit initiative efforts to a 5-8 day period with adequate training on the front end to support the desired efforts.

SECTION 3: FBE KILO AND FBE KILO SEA STRIKE BACKDROP / SCENARIO OBSERVATIONS.

3.1 FBE overlay on Exercise Construct

Observation: FBE Kilo construct only loosely fit the Tandem Thrust 03 construct.

Discussion: The overall FBE construct that was layered over the exercise construct was adequate for execution had the exercise construct been completed. Database testing for the event was woefully lacking and joint force (JFACC) participation was almost nonexistent. This resulted in errant databases (MIDB, AODB, BSCMs), that did not function properly. Initiative and technology reliance on this information suffered through execution because of this. While this may have been out of the NWDC purview for the FBE, it highlighted that even for a tier 1 level JTF event that database integrity should not be assumed.

Recommendation: Planner and technologies must participate in any exercise database testing events that are integrated into the FBE construct.

3.2 Exercise Augmentees

Observation: C7F only received a small percentage (+/- 30%) of the planned staff augmentation and component augmentation that was required to carry out the Sea Strike initiatives.

Discussion: Events beyond the control of both the MBC and the numbered fleet resulted manpower shortages that greatly hindered the FBE effort. While these may have been unavoidable, they were foreseen. At some point prior to execution, manning go/no criteria need to be established and utilized to prevent execution of events just for the sake of "doing something." This position must be reached in concurrence with the numbered fleet staff and the decision to execute/not execute made as the result of this prior agreement.

Recommendation: Institute manning go / no go levels during the planning process. Do this in concurrence with the numbered fleet. Be prepared to not execute portions of an FBE if these criteria are not reached.

3.3 Scenario

Observation: FTX scenario did not match (very closely), the FBE Sea Strike live force scenario.

Discussion: This problem was due in most parts to the CJTF (C7F) fighting the sim and live scenarios together when they were designed to be separate. While it may be out of the MBC's control to drive this during execution, there is room to avoid this by properly planning prior. Many FBE have used this detached live / sim event construct successfully, but only when the full staff and the fleet commander himself is intimately familiar with the scenario / events. This was not the case in FBE Kilo. This problem is directly related to lack of numbered fleet involvement in the planning cycle.

Recommendation: Force a higher level of fleet experiment / exercise integration familiarization early and often in the planning process.

3.4 Assumptions and Required Products

Observation: Am assumption was made by the FBE planning staff that certain products required for FBE execution (AODB, MIDB, BSCMs, etc…) would be available.

Discussion: Even though this was a tier 1, JWFC coordinated and congressionally mandated event, the database test was inadequate. This resulted in errant information for use in the XC4I systems used during the FBE. This caused many problems throughout the execution cycle.

Recommendation: NWDC must participate with both planners and technologies in the database test process. If products required are substandard, then they must be identified and corrected prior to execution

SECTION 4: FBE KILO AND FBE KILO SEA STRIKE TECHNICAL/ XC4I OBSERVATIONS.

4.1 Shipboard System Specifications

Observation: USS Blue Ridge has a 10 mb switch backbone that is connected via 155 mb links. This, along with inconsistent network card setting hindered ADOCS use during the FBE.

Discussion: Standard, shipboard LAN configurations that support ADOCS usage need to be established. This applies to switch, link, and network card settings on these machines. Hardware limitations may require platforms to set up multi-server configurations to reduce the effect of less modern network backbones.

Recommendation: Set ISNS ADOCS standards prior to install and configure accordingly.

4.2 Recommended Shipboard System Configurations

Observation: USS Blue Ridge's LAN will require specific ADOCS configurations to support usage on that platform.

Discussion: To reduce the effect of a less modern backbone, placement of ADOCS servers in a multiserver configuration is required. Also standardization of network interfaces is required.

Recommendation: Place ADOCS servers in the following spaces: JIC, JOC (master), JAOC. Configure these machines so they are all pointed at the same switches as the clients they support reside.

4.3 ADOCS recommend software / hardware changes

Observation: Many recommended changes to ADOCS were compiled during the FBE.

Discussion: ADOCS changes are indicative of command and control capability requirements that currently exist. The changes are catalogued below.

Recommendations:

Software

1. Ability to pair a target to an ITO mission via a button
2. Ability to highlights targets in Fires and JSTM managers when changes have occurred…alert?
3. A configurable Fires Manager (within the ADOCS GUI).
4. Add "hour glass" icon to ADOCS to display system working.
5. TST supported CDR indicator in JTSTM.
6. Hot link to ROE url.
7. Hot link to TST priorities url.
8. Creation of a Combat Assessment manager and removal of that function from the Fires/JTST managers.
9. Hot link to target folder url.

Hardware

1. Two (2) displays for ADOCS users that are doing target development and coordination

4.4 JFN interaction with ADOCS

Observation: ATI.ATR target nomination from JFN was incomplete.

Discussion: ATI.ATR target nomination to JFN was incomplete and not really viable for usage. This problem needs to be fixed. It was identified over 2 years ago and is still a problem.

Recommendation: Detailed ADOCS – JFN testing to fix this problem. This should be completed in a lab setting vice waiting for another FBE.

SECTION 5: OPERATIONAL ROAD AHEAD AND OTHER RECOMMENDATIONS

5.1 ADOCS Road Ahead for C7F / COMPACFLT / USPACOM

Observation: ADOCS will be integrated into the PACOM C2 structure. FBE Kilo was a major event in this transition.

Discussion: ADOCS use in FBE Kilo was the first in a series of event that will proliferate ADOCS across the PACOM AOR (it is already in the USFK AOR). Lesson learned for this effort (FBE Kilo) should be passed on to facilitate a higher level of functionality in future PACOM events (IPD, TF04, CG04).

Recommendation: Pass detailed ADOCS report to PACOM via C7F and COMPACFLT to help this effort along. Report should be a NWDC/JPSD collaborative effort.

5.2 Time Critical Targeting Functionality Afloat (TCTF Afloat)

Observation: The Xray Papa cell was an excellent test case for familiarization of the TCTF concept to the fleet.

Discussion: TCTF is a USAF program that outlines the C2 requirements and systems for conducting time critical targeting operations. In support of JCC and JCC (Afloat), the USN needs to further refine this concept to support both joint and maritime forces from a flag configured platform.

Recommendation: Use TCTF Afloat a starting point for Sea Strike initiatives in future FBEs.

5.3 Coalition Fires Experimentation

Observation: Coalition shooter information requirements where not met by the RMG technology.

Discussion: The RMG technology and its approved rulesets did not allow the coalition forces to fully integrate with the other shooter platforms. This problem resulted in SA deficiencies on both sides of the guard.

Recommendation: Develop two paths for future coalition experimentation, one based on full

network integration and the other based on LNO supported by US releasable C2 systems and backbone. Both are viable and critical to continued integration of coalition forces.

5.4 Xray Papa and Maritime Component Time Sensitive Targeting

Observation: The Xray Papa cell identified a time sensitive targeting gap at the maritime component level that needs to be addressed.

Discussion: The JFMCC's conduct of broad scale time sensitive targeting operations that are integrated with other components is beyond the traditional role of the Bravo Papa in most instances. A staff function at the operational level (JFMCC) that supports TST prosecution is required.

Recommendation: Integrate this effort with the TCTF effort described above to help identify maritime TST command and control requirements of the future.

SECTION 6: OTHER KEY INSIGHTS FROM EXPERIMENT PARTICIPANTS

The following are observations from FBE participants during the FTX portion of the FBE. They are a source of information for how people felt about what was happening, including system performance.

XP Cell Lessons Learned and questions from 26 April 2003

ADOCS:

-Though the speed was significantly better than the previous day, there is still a significant time lag from mouse click to display response. This is frustrating to the user and detrimental to timely response to TST.

-The color codes for target coordination need to be defined. There is probably an official standard from real world operations that can answer this question. (Note: Colors legend is available in JTST coordination window, which would be useful on all other windows where color selections are possible.)

-ADOCS/COP - was not updating through the network. Sometimes took several minutes for display change to show up on someone else's computer. Current thought is it is due to the limited backbone capability of the system on board LCC-19.

-Administrative - commonality between systems. Right now everything is wide open, anyone can change anything. Need database manager in loop. Example, if XP is rogering up for something, then he should be the only one that can control that function.

-At various times during day, all machines locked up. We need some help from the technicians to identify the reason for these occurrences.

-Zoom feature reaches a point that causes the problem where Zoom box and system launches out to never-never land.

-Question for technicians: Would system be any faster if we use fewer ADOCS stations?

- PROCESSES:

-On the 27th we will attempt to run one target completely through the system - from Nomination,

through JIC/TST Cell/XP/shooter. While running this end-to-end thread, we will record steps to establish a baseline set of procedures. In order to make this most useful, we need technicians on station looking over our shoulders as we go through the whole process to ensure we are executing in the most efficient manner.
-Where are target folders set up and how will we be made aware that they are available?
-Computer setup - (for future) configurations of set up should be standardized.
-Was not obvious that JIC was pushing targets up to XP. And if they did, how would we know that they did?
-Who can push targets to a TST?
-Only people that can push target should be the ones that can do it on the system.

ORGANIZATION:
-Chatrooms - no idea of who is on what/why/where. Each individual watchstander needs to know what rooms to monitor. (Note: Fleet commanders publish OPTASKs to specify the procedures for using Chat. This is where this is defined.)
-How does XP maintain situational awareness of ISR assets using ADOCS?
-There is currently no one managing ISR assets. Is there a plan for JTF to do this? For this experiment is the ISR manager assigned to someone in the JIC, TST Cell or the XP cell?

C&C:
-Though there is a UAV TTP, handoff guidance and procedures for dynamic retasking of UAVs is not clear. Who will control the UAV or will it be timeshared? If something needs to be checked, who makes the decision and takes control of UAV?

OTHER:
-JFN terminals in the TST Cell are not being used. It was also noted that the USAF personnel manning the TST Cell are under direct orders to not use or even look at JFN.
-There was confusion on what Chat was to be used. The direction from the NWDC FBE team is IRC Chat. The procedures for setting up mIRC Chat was drafted by LT Powell and will be distributed to all participants.

XP Lessons Learned 27 APR 03

ADOCS:
-Speed of response to operator input was so slow it was unusable. By mid afternoon, ADOCS had slowed to a crawl. It was taking 2-3 minutes wait time for system response after each key entry.

PROCESSES:
-Initial position of TB0037 plotted position in water west of island. JFACC pushed target to JFMCC (XP). The TBMCS position was ok. JIC had to go in system and manually re-enter coordinates. Total time to correct entry was well over an hour.
-DDx listed CDCM as a Cruise Missile Submarine in target folder. This was never corrected even after bringing to attention via chat and telephone.
-Control of UAV. Not as many assets available - was not communicated to XP. No priority in

tasking limited assets. XP can establish priorities, but there was a lack of coordination. DDx had control and when it was finished, it did not give a positive hand-off to the higher authority or to the next unit for control. So UAV just flew around aimlessly for some time.
-Still some lack of positive feedback in chat. Example is TB0037 -when we requested a position confirmation, we did not get an feedback that they were working the issue.

XP Lessons Learned 28 APR 03
ADOCS:
-Speed of response to operator input improved significantly. Operators felt it was still slow but usable.
-BDA -initially there was no way to change color on that tab. This was corrected prior to endex.
-ADOCS locked up with system fault error.
-Restrike issue. Confusion over what the restrike function does. Recommend ADOCS be modified to have restrike field show old mission number as well as target type.

PROCESS:
-Unless testing is short fused due to malfunctions in system, please let everyone know ahead of time that test tracks are going to be entered into system. This will preclude spinning wheels on test tracks.
-Target Positions: Initial position has been incorrectly entered two days in a row. Believe this is due to recording wrong lat/long off of imagery? This was noticed due to targets being plotted in water on ADOCS. If by chance they were wrong, yet plotting on land, there would not be an easy way for someone to catch the error.
-Overall process is becoming clearer, but from XP_ISR viewpoint, still unsure of role and information flow.
-E2 process of nominating a target - they are in freeplay mentality. We were able to get them to push a target into ADOCS, but no amplifying information (imagery, etc.) E2's guidance is to attack targets that meet ROE. They were in ROTA today, which was not in operational area. They need to get out of sim mode and support the exercise.
-E2 guys need to review days ATO and work within confines of ATO.
-DDx was not given control of UAV today, so they were unable to id targets.
-TST cell does not have a fires manager, so they don't have situational awareness. Recommend they be given option to look at Fires manager to know when mission has been fired by the ship.
-Command and control of process much improved today, thanks to ADOCS Tab color reference chart.

XP Lessons Learned for 29 APR 2003
ADOCS:
-Time lag between here and DDX. Example, we will change a block to green and one time it as long as 5 minutes for it to show up at DDX.
-Recommend system permissions be put in place for ADOCS, as it seemed that blocks were being changed quite often by the wrong team.
-Fires manager often would not update automatically, requiring the operator to close and reopen to get changes to show.
-Deliberate targets were interfering somewhat with the TST processes. Too many targets were

in the queue to adequately evaluate and take action. We can hide the ones that we don't want to see.
-Confusion on who was submitting TST. Recommend adding something in ADOCS so everyone knows who is nominating to TST. You actually can by using the history function.
-According to Coalitions Fires in NPT, if VANZAC edits ANZ tab (Missions Coordination Manager) it fires the mission. They aren't editing the ANZ tab. ?
-FDR Block (Missions Coordination Manager) stayed yellow on BLR ADOCS side. Coalition Fires side of ADOCS after weapons release was showing green. Target was TB0041.
-VANZAC requested guidance on number of ERGM rounds to fire. Cannot specify number of rounds in ADOCS. Does unit or XP determinate the number of rounds to fire. Actually can specify number of rounds under engagement tab.
-VANZAC was unclear on tab protocol. XP developed and disseminated tab protocol during the exercise, but tab protocol/documentation required prior to STARTEX to clarify requirements for exercise participants. I recommended this to Chris Vogt and also stated that in order to properly operate the system for real world operations, people need to train and operate the system in numerous scenarios for 30-45 days.
-Multiple ADOCS system down times hindered play. Chat successful in engineering work around during ADOCS outages.
-A single monitor workstation is inadequate for an ADOCS operator. It is our opinion that the proper set up for an ADOCS operator would be a three monitor work station, VoIP, and a phone.

PROCESS:
-CHAT protocol. Confusion on chat - due to large numbers of people on ISR-COORD, sometimes questions were not responded to. Or unanswered for long periods of time. Recommend all players leave their chat windows open so they can go back and review periods they might have missed. Other channels seemed to be better.
-Need to have clearly defined chat protocols for all, with the right players monitoring the right chat windows.
-UAV assets were often not available to support PID. ANZAC's use of UAV not as real time as DDx's due to requirement to go through email to JIC.
-Problem with target folders not being available or updated for a period of time in afternoon. This was corrected.
-Confusion between XP and DDx during lunch hour. Recommend everyone break at same time formally. UAV schedule for DDx included our lunch hour, so they effectively lost an hour of UAV time.
- E2 wanted to control options for WTP of airborne assets. XP does WTP for airborne assets.
-When target is TST and fired, who fills in block on Fires for BDA tab? Recommend in Fires page, firing unit inputs to XP via chat, XP update BDA block on Fires and then JIC turn BDA box on TST page.
-Air gap latency didn't appear to hinder VANZAC response to chat.
-VANZAC achieved chipped image electronic transfer into FBE-K target folders at NPT for web dissemination.

JIC Daily Summary for 26/27 APR 03
ADOCS:

1. Couldn't get target noms from TES-N most of both days due to system issues. Work around was to put nominations in manually. (see Process)
2. Also had shut down of conduit which passes imagery (with metadata) to PTW from TES-N resulting in inability to generate aimpoints/mensurate targets.
3. Recommend for future experiments with ADOCS tool being used by novice players that practical training be provide for all users with respect to the role they will play.

PROCESS:

1. Need to more fully define process requirements for manual target nominations particularly with respect to those noms which should be coming from TES-N (TB-designated target numbers) but don't because of system down problems. There needs to be a fully flushed process for down system situations.
2. When tasking ISR assets, direction needs to be provided on releasing the asset from the request once collection requirement has been satisfied.
3. Need to establish process for mapping BHA/BDA IRS back to original TST. In real-world environment data flowing in from multiple sources could potentially be too voluminous for an imagery screener or analyst to randomly pick up on as the follow-on tasked BHA/BDA ISR input for a particular target, particularly if multiple targets are being serviced simultaneously.
4. (In conjunction with #3) Need to determine whether follow-on imagery, for example, for BHA/BDA after a target has been serviced should be nominated as a new target or just mapped to original target nomination.
5. One cause of today (4/27) TES-N issues had to do with database log files filling up and saturating the server. Sys/DB Admin process needs to be in place to clear log files periodically or provide warning to Sys/DB Admin contact in the event a critical quantity has been reached before a set clear time point.

ORGANIZATION SETUP:

1. For experiment purposes it would be beneficial to have an organizational setup flushed that mimics real-world hierarchy with clearly defined roles and responsibilities. Organizational setup for the experiment should be documented for next experiment with brief explanation of role intentions/responsibilities. Would be particularly helpful for manning for the experiment and for flushing out true requirements in real-world scenario.
2. Who is responsible for tasking ISR assets for BHA/BDA imagery/assessment.
3. Who is responsible for assessing effectiveness of strike with regards to a serviced target? And for updating the blocks in ADOCS.

COMMAND & CONTROL:

1. Need to clearly define who can task ISR assets and whether there are any restrictions on directed tasking.

JIC Daily Summary for 28 APR 03

ADOCS:

4. TES-N still experiencing problems. Unable to obtain stateside support through the night (Guam time.) Used work-around all day for manually submitting target noms and passing

imagery to ETFs (electronic target folders). Documented procedures.

5. How would someone know in ADOCS that multiple target noms/tst in either (or split between both) the Fires Manager or Joint Time Sensitive Targets Manager are associated with one another? Or is this relevant?
6. How would someone know from looking at a target nom in the Fires Manager in ADOCS that it has been elevated to a tst already? Or is this relevant?
7. No one could change status color of BDA block. Should be resolved by 4/29 session.
8. ADOCS training should include an example of requesting re-strike for a TST and how the system processes this input.
9. ADOCS started up much quicker after the fix for the BDA color block not being editable.

PROCESS:

1. Need to resolve process with regards to performing a re-strike on a serviced tst. How should the target nom be handled? Issue resolved during hot wash with clarification of how ADOCS system handles re-strikes; i.e., a new TST is created with '-RESTRIKE' appended to original target nom's description (SA-06-RESTRIKE in today's event).
2. (Regarding 1) To clarify for others what a new TST with a "- Restrike" descriptor was generated from, the controlling component who recommends the original TST for a re-strike (AB0024 in today's event) can (this worked once but needs validating):
    a. call up the new re-strike TST in the JTST Manager (AB0027 in today's event)
    b. click EDIT on the TARGET DATA tab, and
    c. modify the DESCRIPTION to include the original TST target number (AB0024):
        New Descriptor for AB0027: SA-06-RESTR AB0024
    Note: There is a 18-character limit on the number of characters that will display.
3. Did not know how to contact U2 POC for afternoon event. Didn't have chat handle or other contact info.
4. JIC is struggling with providing accurate geo-coordinates on target nominations due to the poor quality of the simulated video feed blurring the geo-coord data. This can be correct with better video.

ORGANIZATION SETUP:

1. Organization structure and responsibility seemed smoother today.

COMMAND & CONTROL:

1. Still struggling with defining who controls which blocks in ADOCS for coordination and planning purposes. Chart provided in afternoon should resolve much of this confusion.

OTHER:

1. U2 imagery initially off geographically from planned event, but was resolved.
2. U2 simulation problem caused an extreme slow down in exercising the afternoon event.

JIC Daily Summary for 29 APR 03

ADOCS:

10. TES-N feed working much better today! Be advised when the target nominations are submitted directly from TES-N to ADOCS, players will notice approximately a 10-min

lag before the associated image will appear in the ETF.

11. Can ADOCS not be designed to store the images within its own database to provide ready access to individuals managing the target process using ADOCS?
12. Limitation of TES-N nomination screen does not allow operator enough target TYPE choices to select the correct one in most instances (for e.g.: SA-15 from this morning's event was initially entered as a Heavy Vehicle). This requires modification of the target nomination's target TYPE once it appears in ADOCS. Could be confusing to individuals closely monitoring the Fires Manager.
13. In the afternoon the ETF server experienced some technical difficulties which resulted in ETFs not being created and imagery not appearing in ETFs for E2 submissions from GISR-C.
14. Acquired date/time group not populating the Target Data tab of the Fires Manager.
15. For target nominations submitted from BLR JIC TES-N stations, the NLT dtg is being populated incorrectly. The JIC will add one hour to this dtg in their noms.

PROCESS:

5. To keep responsible parties informed, add the Time-on-Target data to the Remarks block of the Collection Request tab (available after double-clicking the target in the JTST Manager.)
6. The JIC Target Officer or JFN Operations Officer can make an initial recommendation for a target nomination to be raised to a TST. The controlling component should then validate this target to be a TST. If controlling component disagrees, annotate decision in appropriate block. Then move the target from the JTST Manager back to the Fires Manager by highlighting the target and selecting from the menu Tools > Target to Fires Manager….
7. Wondering if the images submitted by GISR-C operators are being properly attached to the nomination? If so, need to research why the images are not showing up in the ETF folder. This deficiency is causing confusion in the process with regards to issues like PID. Note: Have not been able to find an image in an ETF except one processed by JIC.

ORGANIZATION SETUP:

2. Due to the artificiality of the experiment, the technical setup (what systems are doing what and what their capabilities are) is causing some confusion with who should be contacted in certain situations; For e.g.: to see streaming video feed of UAV #2 and for posting a missing image to an ETF for a target nomination not submitted by through BLR JIC TES-N.

COMMAND & CONTROL:

2. Some confusion with who controlled what equipment for providing tactical data for targeting. Resolved in hot wash meeting.
3. Some confusion also about where ISR assets should be allocated. Determination was ISR assets should not leave assigned area per ISR Sync Matrix.
4. JIC will direct ISR assets for BDA purposes when feasible.

OTHER:

3. Problems with telemetry data passing from the U2 in morning disabled ability for imagery screener to get an image for better imagery and overview shot of area to enhance PID capabilities and improve target accuracy. Could not run this scenario concept.
4. A problem with the server script which creates the ETFs resulted in several ETFs not being created for about 30 minutes until the issue was resolved.

JIC Daily Summary for 30 APR 03

ADOCS:

16. Still some confusion as to who controls BDA blocks and how to set the MSN blocks to provide specific status of a target being prosecuted.
17. Updates to JTST Manager are not appearing without closing and re-opening the manager.
18. TB0041 showed up as two separate TSTs in the JTST Manager during the morning event. The system is not suppose to allow multiple submissions of a target nom to TST Manager.
19. If DTG must be entered with a 4-digit year, ADOCS Fires Manager > Add screen should not allow the target nomination to be entered.

PROCESS:

1. Confusion regarding JIC ADOCS target nominations. Need to put one in. JIC thought these were only being filtered for convenience and informed others of new ABxxxx nom but it still confused everyone.
2. JIC needs clarification on what everyone expects from them as relates to the JIC tab.

ORGANIZATION SETUP:

1. Need to have clarification on BDA input responsibilities. Who is tasking assets to do the collection, who is collecting and assessing imagery for it, who is managing the color block?

COMMAND & CONTROL:

5. Needs to re-fine control block chart for ADOCS coordination tabs. Need to include most common data codes which appear in color coordination blocks. E.g.: EXE in Yellow MSN block in JTST Manager.
6. Working on better situational awareness among JFN group.

OTHER:

1. Continued problems with imagery feed and telemetry data passing from the U2.

JIC Daily Summary for 2 MAY 03

ADOCS:

20. If data in a TST coordination tab is updated and saved and then another TST is selected, the data from the first TST's coordination tab is appearing. This is confusing when working similar targets. One thinks the data has been updated but when close Modify window, the changes do not appear (b/c they weren't made b/c it looked like it was

updated in the window.)

PROCESS:

3. If BHA/BDA is requested, need to consistently have some documentation in ADOCS of TOT either on the Target Data tab or the Collection Request tab before a strike is launched. Recommend always setting TOT in Target Data tab because time shows up in the main JTST Manager window to the left of the PRI column.
4. Re-strike TST entries (eg:AB5088) did get a Target Folder created. Created one manually.

ORGANIZATION SETUP:

2. JFN/JIC was confused about if collection assets were needed on FDB for post-strike BHA/BDA for AA0366-AA0368. BDA assessment was provided after strike in Fires Manager which assessed the target to be destroyed.

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Appendix F. JFMCC XP TST CELL FOR FBE - KIL0

The following is a Draft document describing the JFMCC XP Cell TST operations.

Position Titles and Job Descriptions

Duty positions and functions that play a major role in prosecuting time critical/time sensitive targets for FBE-Kilo are listed below. These duty positions are identified as the focal points for each specialty supporting the TST Team.

The XP Actual may call JFMCC TST team members into a huddle physically or virtually as required. The minimum number of personnel required for Force-level command and control (C2) and intelligence support for prosecuting time sensitive targets within the JFMCC is dependent on the venue. The position members are keyed to the illustration provide at Figure 1.

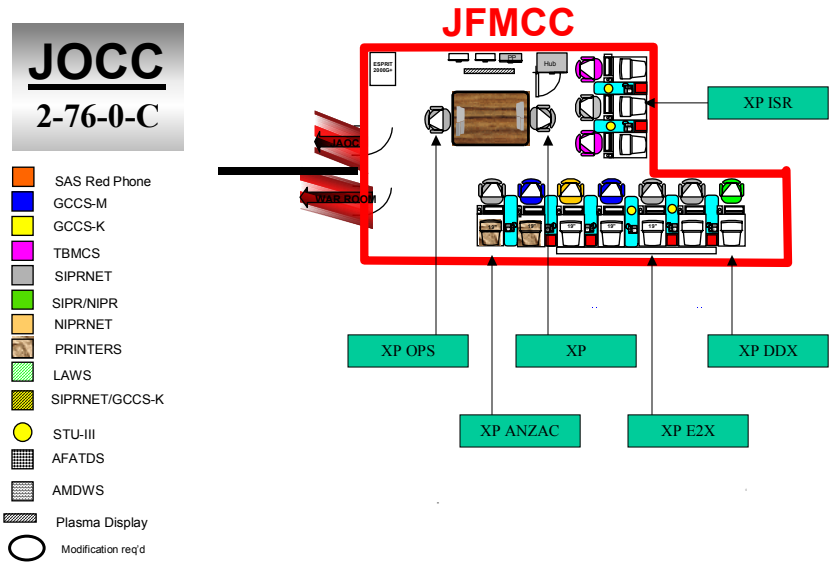

Figure 1 JFMCC XP TST Cell Position Titles and Job Descriptions

Duty positions and functions:

XP Actual (position XP)

- Responsible to the Joint Force Maritime Component Commander (JFMCC) for the execution of the TST mission within the JFMCC's designated area of TST responsibility.
- Retains strike authorization authority against TSTs within the area designated by the JFMCC.

- Directs TST operations to include all aspects of the TST operations to include target nomination, validation, approval, pairing, coordination and execution.
- Authorize, through ISR Operations Officer, redirection, and reallocation of JFMCC ISR assets to include all aspects of the TST ISR operations to include approval, pairing, coordination and execution.
- Briefs JFMCC as required for TST Ops.
- Coordinates with the TST mission elements on at least a daily basis if not more frequently.
- Coordinates with all the component mission commanders on TST operations issues via daily virtual coordination meetings.
- **Reports to**: Joint Force Maritime Component Commander (JFMCC)
- **Specialty:** Aviator with operational strike/targeting experience and/or Field Grade Officer with extensive operational strike experience and/or command and control expertise
- **Workstation**: ADOCS, SIPRNET and Collaboration Application (e.g. mIRC)
- **Links**: Secure telephone (STU-III) link to JFMCC, ADOCS connectivity to JFACC
- **Engagement Sequence and Notional Data Flow**: TBD

XP Current Operations Cell Chief (position XP OPS)

- Responsible to XP for the execution of his routine and additional duties as required.
- Responsible to the XP for monitoring the execution of the TST mission within the JFMCC's designated area of TST responsibility, and advising XP on any problems.
- Coordinate with various operational control agencies/commands to synchronize and de-conflict TST operations.
- Prepares and coordinates responses to, and daily debrief for JFMCC.
- Coordinates with the mission elements on at least a daily basis if not more frequently.
- **Reports to**: XP
- **Specialty:** Field Grade Officer with extensive operational strike experience and/or command and control expertise
- **Workstation:** ADOCS, SIPRNET and Collaboration Application (e.g. IWS)
- **Links:** TBD
- **Engagement Sequence and Notional Data Flow**: TBD

XP ISR Operations Officer (position XP ISR)

- Directs ISR assets (UAV, U2) toward emerging potential TST for collection.
- Provides dynamic tasking requests, for assets under direct control, through the appropriate platform LNO if that asset can prosecute the target without impacting the current collection plan.
- Coordinates with the UAV and other ISR assets to optimize sensor collection and reposition allocated ISR assets' collection capabilities to obtain best quality image for TST.
- Maintains liaison with JTF/JFACC ISR Operations Officer(s) for dynamic re-tasking requests of ISR assets not under direct control.

- Develops and submits inputs to collection management plan to support TST objectives.
- Coordinates on IMINT precision geolocational points, collateral damage estimates, no-strike de-confliction, and weaponeering solutions with the targeting officer
- Provides predictive TST analysis to in support of current and future ISR management of sensors.
- Provides support to the MOC TST Ops for visualization of TST event-related activity to include predicted enemy courses of action for TST support
- **Reports to**: XP OPS.
- **Specialty**: Intelligence Officer (O4) or Air Battle Manager with recent and extensive C2ISR background
- **Workstation:** ADOCS, SIPRNET and Collaboration Application (e.g. mIRC)
- **Links:** ADOCS, SIPRNET and secure telephone (STU-III); connectivity to onboard and off-board intelligence support.
- **Engagement Sequence and Notional Data Flow**: TBD

XP Air Operations Officer (position XP E2X)

- Facilitates TST execution of air (Navy and Air Force) Strike Assets.
- Coordinates with CVW Strike Operations and Joint ISR Officer
- Coordinates with Air Force Strike LNO and Joint / Collation Strike Officers (if embarked)
- Liaison with JFACC CAOC for coordination and de-confliction of air assets.
- Coordinates with JFN ISR Operations for TST Target Data Refinement and Battle Damage Assessment (BDA) and Bomb Hit Assessment (BHA)
- Coordinates TST sensor-to-shooter operations
- Facilitates TST execution of ground (e.g. Marine, Army) Strike Assets.
- Coordinates with Air and Surface/Submarine Anchors

  Coordinates ground TST sensor-to-shooter operations
- **Reports to**: XP OPS.
- **Specialty**: CVW experience, senior strike aircrew (O4/5)
- **Workstation:** ADOCS workstation on SIPRNET with Collaboration Application (e.g. IWS) application
- **Links:** ADOCS, SIPRNET and secure telephone (IP)
- **Engagement Sequence and Notional Data Flow**: TBD

XP Surface Operations Officer (position XP DDX)

- Facilitates TST execution of surface strike assets.
- Coordinates air and land operations with JFMCC and JFACC.
- Coordinates with JFMCC and JFACC for current air and surface operations.
- Coordinates Surface TST sensor-to-shooter operations.
- Facilitates TST execution of ground (e.g. Marine, Army) Strike Assets.
- Coordinates ground TST sensor-to-shooter operations.
- **Reports to**: XP OPS
- **Specialty:** tactical strike weapons experience, senior tactically qualified officer

- **Workstation:** ADOCS workstation on SIPRNET with Collaboration Application (e.g. IWS) application.
- **Links**: Access to ADOCS, SIPRNET and secure telephone (STU-III)
- **Engagement Sequence and Notional Data Flow**: TBD

XP Coalition Surface Operations Officer (position XP ANZAC)

- Facilitates TST execution of coalitions surface strike assets.
- Coordinates coalition air and land operations with JFMCC and JFACC.
- Coordinates with JFMCC and JFACC for current air and surface operations.
- Coordinates coalition surface TST sensor-to-shooter operations.
- Facilitates TST execution of coalition ground (e.g. Marine, Army) strike assets.
- Coordinates coalition ground TST sensor-to-shooter operations.
- **Reports to**: XP OPS
- **Specialty:** tactical strike weapons experience, senior tactically qualified officer
- **Workstation:** ADOCS workstation on SIPRNET with Collaboration Application (e.g. IWS) application.
- **Links**: Access to ADOCS, SIPRNET and secure telephone (STU-III)
- **Engagement Sequence and Notional Data Flow**: TBD

Targeting Officer (position TGT OFF)

- Determines which available ISR asset is best suited to address the emerging or "pop-up" potential TST.
- Coordinates dynamic tasking requests with ISR Ops Officer in support of JTF and JFACC TST collection opportunities and priorities.
- Maintains liaison with JTF/JFACC ISR Operations Officer(s) for dynamic re-tasking requests of ISR assets not under direct control.
- Accesses available IMINT, SIGINT, MASINT and other ISR raw data to determine potential TST's "detection".
- Provide targeting guidance to Imagery Screener concerning which threat/s to screen for based on available intelligence within guidelines of JTF and JFACC TST targeting requirements.
- Inputs target nominations manually into ADOCS if TES-N feed inoperable.
- Forwards target nomination imagery to electronic target folders (ETFs) for purposes of experiment.
- Reviews raw and finished target nomination data and provides TST target predictive analysis to TST Ops based on the JTF TST Targeting requirements in daily intentions and guidance as well component commanders' TST guidance. If so elevates target to TST.
- Coordinates with JAOC LNO and XP ISR contacts to keep informed of potential TSTs and developing details.
- Provides input for positive identification (PID) and collateral damage estimates (CDE) for TSTs.

- Assesses BHA/BDA and will control BDA block in ADOCS for BHA/BDA imagery processed by or provided to the JIC.
- Provide support for developing SOP/TTP to manage and direct 7F JIC JFN operations.
- **Reports to**: JFN Operations Officer.
- **Specialty**: Intelligence Officer (O3) or Targeting Officer experience
- **Workstation:** ADOCS, SIPRNET and Collaboration Application (e.g. mIRC)
  Links: ADOCS, SIPRNET and secure telephone (IP); connectivity to onboard and off-board intelligence support.

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Appendix G PROGRAM OFFICE SURVEY

The JFN Program Office conducted a parallel examination of JFN performance during FGE-Kilo. Part of that study was a survey of participants. The following is a summary of the results of that survey and the survey form. This information was provided by the program office participants.

High-level Analytical Objective:

Document TES functionality and products in the IPB process.

Experimental Issues:

How do TES products contribute to the IPB process?
Do TES products enhance predictive analysis of enemy course of action?

Findings:

This analytical objective focused on the process and configuration of TES, GCCS-M and ADOCS as they relate to the IPB process in the Joint Intelligence Center (JIC). Doctrinally, IPB provides a systematic, continuous process of analyzing the threat and environment in a specific geographic area. It is designed to support staff estimates and military decision-making. Applying the IPB process helps commanders selectively apply and maximize his combat power at critical points and times in the battle space.

The JIC intelligence staff was surveyed on whether the JFN enhanced the IPB process and TST operations. The specific focus of JFN enhancements was TES. There were certain constraints to the experiment that may have influenced their opinion. These constraints include manning, training, and scenario relevancy. While the sample was small; there were some insights that emerged.

25% of the respondents agreed and 75% of the respondents indicated that TES aided in identifying gaps in the commands knowledge of the threat and the current threat situation.

25% of the respondents agreed and 75% of the respondents had no opinion that TES products were used to portray threat models that included doctrinal templates. Additionally, the same percentages were reflected in the respondents' perception of TES products usefulness in developing models that depicts threat courses of action.
25% of the respondents agreed and 75% of the respondents had no opinion on ADOCS usefulness in providing TST operations situational awareness.

25% of the respondents disagreed and 75% of the respondents had no opinion that ADOCS provided useful information to continuously update the enemy situation template.

All respondents agreed or strongly agreed that there was effective coordination between the TES

imagery screener, the ELINT screener, and the video screener.

All respondents agreed that the imagery analyst processed imagery accurately and timely.

50% of the respondents agreed and 50% of the respondents had no opinion that the configuration of the JFN systems in the JIC was sufficient to ensure fusion of intelligence was accurate and timely for targeting.

25% of the respondents agreed and 75% of the respondents had no opinion that JFN provided the tools to fuse products that would answer the commander's priority intelligence requirements.

All respondents agreed or strongly agreed that the configuration of the JFN systems in the JIC was sufficient to facilitate collaboration between different functions.

50% of the respondents disagreed and 50% of the respondents had no opinion that track elements on the TES Integrated Tactical Display (ITD) were the same as the GCCS-M COP.

66.66% of the respondents disagreed and 33.33% of the respondents had no opinion that ADOCS and JFN systems provided situational awareness of theater wide ISR operations.

75% of the respondents agreed and 25% of the respondents had no opinion that the JIC provided targeting data to the JAOC and XP to support TST operations.

All of the respondents disagreed that the JFN systems were technically reliable.

Conclusions:

Several constraints to the data collection and analysis efforts preclude making definitive conclusions. These constraints include: small sample size; technical difficulties; control of the experimental design; and adequate manning. However, there are several insights that can be extracted form the data.

TES capabilities has the potential to contribute to the IPB process. Noteworthy was TES contribution to portray threat models that included doctrinal templates, and their usefulness in developing models that depicts threat courses of action.

There was not any data to support confidence in that TES and GCCS-M had a common picture of the friendly and enemy situation.

There were indications that the configuration of the JIC was sufficient to ensure that capabilities of different systems could be applied to fusion of intelligence products.

Technical performance was a significant factor the limited optimal operational capabilities.

1. TES aided in identifying gaps in the command's knowledge of the threat and the current threat situation.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

2. TES products were used to portray threat models that included doctrinal templates (which depict how the threat operates when unconstrained by the effects of the battlefield environment).
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

3. TES products were helpful in developing enemy COA models that depict the threat's available COAs.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

4. ADOCS capability to provide TST operations situational awareness was useful during the IPB process.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

5. ADOCS capability provided me sufficient information to continuously update the enemy situation template.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

6. There was effective coordination between the TES imagery screener, the ELINT screener, and the video screener.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

7. The track elements of the TES Integrated Tactical Display were the same as GCCS.M COP.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

8. ISR planning supported TST operations.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

9. The TES Mission Planner was useful in planning and synchronizing theater and national ISR assets for TST operations.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

1. ADOCS and JFN systems provided situational awareness of theater wide ISR operations.

Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

2. The imagery analyst processed imagery accurately and timely.

Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

3. The JIC provided targeting data to the JAOC and XP to support TST operations.

Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

4. The JISE chief was able to timely fuse information from the targeting officer and collection manager in order to make re-strike recommendations to the JAOC.

Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

5. The electronic target folders (ETF) were useful to the IPB process.

Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____

_____

6. The senior intelligence officer in the JAOC had the same enemy COP as the JIC.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

7. JFN including ADOCS provided the capability to distribute intelligence information that was accurate and timely.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

8. The JIC, JAOC and subordinate units had a common picture of the enemy.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____
_____

9. Configuration of the JFN systems in the JIC was sufficient to facilitate collaboration between different functions.

Strongly Disagree Disagree Neutral Agree Strongly Agree
Comments:_____
_____
_____
__

10. Configuration of the JFN systems in the JIC was sufficient to ensure fusion of intelligence was timely and accurate for targeting.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____

11. JFN provided the tools to fuse products that would answer the commander's priority intelligence requirements.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____

12. JFN gave provided the capability to better synchronize theater and tactical ISR plans to support targeting.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____

13. JFN provide the capability to better dynamically re-task sensors to support targeting and IPB.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____
_____

14. JFN systems and ADOCS were generally reliable (i.e., outages, network problems, data base access, etc).
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____

15. Collaborative tools were sufficient to coordinate events.
Strongly Disagree Disagree Neutral Agree Strongly Agree

Comments:_____
_____

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Appendix H CPX PRINCIPAL RESULTS AND RECOMMENDATIONS

This Appendix contains the Recommendations and Principal Results from the Command Post Exercise (CPX) portion of FBE-Kilo. Many of these results and recommendations also apply to FTX. Those that do directly apply are also included in Section 6.2, Principal Conclusions and Recommendations, of this report.

H.1 CPX PRINCIPAL RESULTS

FBE-Kilo, Command Post Exercise Phase

PR #1 - Achievement of SOP Testing Objective

- Experimentation difficulties prevented an adequate determination.
  - No manning of JFACC Afloat.
  - Lack of JAOC manning.
  - TES-N operators lack of training.
- CPX was modified to be mostly training for FTX.

This initiative was to test JFN support for TST, and the associated SOP, for operations in the three roles for which it will be employed by C7F:

as an embarked CJTF with other supported staff(s) embarked,
as an embarked JFMCC/NAVFOR, and
as the Fleet JFN/JFN supporting deployed RTCs and RTC Lites.

Key equipment components were an afloat JFN (supporting the JTF staff and a JFACC forward) and an ISR-M supporting the JFACC Main.

Key participants include the entire CJTF command structure and Component Commanders. JFACC participation was essential to meet the majority of objectives in addition to supporting examination of USAF ISR Manager (ISRM) to JFN operations.

The CPX was the only time during TT03 that full CJTF manning was to be in place, which is necessary to validate the CONOPS and associated standing procedures.

Not having a manned JFACC Afloat eliminated a major component of SOP testing that was to be accomplished. JAOC personnel shortage also had a detrimental effect on exercising the SOP.

With one exception, personnel in the JIC had no experience with TES-N. The result was that a major portion of CPX was devoted to training rather than initiative experimentation.

Equipment difficulties also played a major role in reducing the ability to obtain results for this initiative (see PR #2).

The basic objectives of this initiative could not be met. Indications of needed SOP development for a JIC, if it is to participate in TST, were determined.

FBE-Kilo, Command Post Exercise Phase

PR #2 - Achievement of JFN Contributions to TST Objective

- No baseline without JFN available, cannot perform an adequate test

The stated JFN objective was to determine the contribution of JFN to TST prosecution. In order to determine JFN-unique contributions, or synergistic JFN effects, a baseline of performance without JFN is needed. Such a baseline requires using the same C2 structure and information processes as were used in the experiment. Baseline information is not available.

Equipment problems prevented testing end-to-end JFN performance. Target nominations could not be passed directly from TES-N to ADOCS, or directly to ISRM. FBEnet was not operational due to Ku Band switching problems in Hawaii. The result was that many information paths that are crucial for realizing JFN potential were not operational.

Because of the collection of equipment and manning problems the only comprehensive test of JFN that could be made was of the TES-N component in the JIC.

The basic objectives of this initiative could not be met. Results that could be derived are indications of JFN potential for TST processes within a JIC.

FBE-Kilo, Command Post Exercise Phase

PR #3 - TES-N Capabilities

- Works well for IMINT exploitation.
  - Video screener a major factor in closing TST timeline.
  - Directing tactical imagery assets.
- Inability to drop validated aim points a major drawback.
- Improved sensor control by image analyst required.

Image analysis and processing worked well, essentially creating/producing an efficient assembly line. Operators, with little training, were able to explore images and make both analysis and processing decisions fairly quickly. (Difficulties encountered because of the simulation are covered in a subsequent Principal Result.)

An important capability was for the image analyst to be able to direct tactical sensors. The analyst worked through a sensor manager and the process worked moderately well. There were difficulties with this sensor control, as implemented, in that there was no direct provision for sensor control at the analyst's terminal. A direct link that the analyst can use without interrupting, nor losing sight of, imagery is needed.

There were problems with imagery information content. Transmission of aim points and Lat-Long needs to be improved. This was done verbally or by notes, which slowed the process.

FBE-Kilo, Command Post Exercise Phase

PR #4 - TES-N Personnel Issues

- Only the team leader was an experienced operator.
  - Lack of operator training hindered TST operations.
- New operators learned very fast.
  - Performed quite well with minimal training.
  - Could determine whether performance difficulties were due to equipment or training.
- New operators did not understand full spectrum of TST process.

The TES-N team leader in the JIC was an IS1 who had 9 months of intensive experience with the system. He was the trainer for a team of three Sailors who had no experience or training on the system. On-the-job training was performed during the experiment. It is to be expected that the performance of well-trained operators would be better than those in the midst of training and that this had an impact on TST processes. It was not possible to determine which process performance difficulties were the result of an operator lacking proficiency or due to JFN capability difficulties.

It was surprising how fast the new operators learned how to use TES-N. They were performing image analysis and TST nominations within a few hours of developing familiarity with the system. This speaks well for the performance to be expected with JFN.

Operator performance was hindered by their learning only that portion of the TST process they were performing. Performance will improve when operators understand the full process and how the functions at the node they are working fits into the overall process.

FBE-Kilo, Command Post Exercise Phase

PR #5 - Operator's Acceptance of TES-N

- In spite of lack of familiarity, operators recognized the system's potential for improving performance and efficiency
- User-friendly and easy to learn.
- Much appreciation of several functions combined in one machine.

With the exception of the team leader, the TES-N operators were totally unfamiliar with the system and with TST processes. Their training was on IPB processes. Thus, they were being introduced to both a new system and a new process. In spite of this they were enthusiastic about TES-N.

They felt the system was easy to learn and that the graphical user interface (GUI) layout and methods of use were fairly intuitive.

The system layout was such that a terminal could be used for image screening, image analysis, or nomination. This allowed those operations to be exchanged or shared. Having multiple functions resident within one machine produced manpower savings as a result of increased work efficiency and direct sharing of information between operators.

FBE-Kilo, Command Post Exercise Phase

PR #6 - TES-N Training Issues

- Current simulation hinders training.
  - Lack of reality interfered with all aspects of training and performance.
  - Simulation designed specifically for TES-N training needed.
- Operators need broad TST process training.

CPX was used to provide TES-N operator training in an operational context. But, the simulation used for the experiment presented unrealistic renderings of battlefield objects. This lack of realism interfered with operator performance and therefore with their training. In addition to low fidelity, the presentation of the battlefield was such that image analysts could not distinguish different instances of the same object type. This produced a situation where operators were moving back and forth between objects to figure out which was which, interfering with training.

A realistic simulation designed specifically for TES-N training is needed.

Operators did not have an understanding of the TST process. Training on the TST process was being conducted at the same time as how to do it. Training on the full TST process is needed as a prerequisite to system "knobology" training.

FBE-Kilo, Command Post Exercise Phase

PR #7 - Experimentation Issues

- Experiment and Exercise were decoupled.
- Greater emphasis needed on learning spirals prior to operational field experimentation.
- Complete exercising of equipment and validation of functions required prior to operational field experimentation.

The exercise proceeded through the MSEL events in good fashion. Due to a number of factors mentioned earlier it was not possible for the experiment to proceed in the same fashion. The result was that the two became decoupled. It was not clear that it was planned for the exercise to depend on information coming out of TES-N in the JIC, but in execution it did not. Thus, the experiment became one that could have been performed anywhere. A shipboard operation and a real operational environment were not needed nor used.

This brings into question the wisdom of having operational field experiments be a principal information collection means. Savings could be realized if Navy experimentation were to concentrate on learning spirals and having operational field experimentation done only when necessary to validate results in an operational environment.

CPX suffered significantly from not having equipment operate properly. A process is needed where an experiment is not undertaken until equipment has been fully tested, determined to be functioning properly, and warranted to be ready to fully support the experiment's objectives.

FBE-Kilo, Command Post Exercise Phase

PR #8 - Fleet Follow-Up

- Little Fleet follow-up has occurred after former FBEs.
  - Operational improvements have been lost.
  - Fleet recommendations for program improvement have not occurred.
- FBE-K opportunities.
  - TST SOP
  - Design of Fleet Flagship as a JFN TST hub.
  - TST processes and SOP for less well-equipped units.

The pace of FBEs formerly has been such that the planning for the next experiment is underway before the current one is concluded, certainly before analysis is completed. This has prevented lessons-learned from being carried forward to the next experiment. It has also precluded investing the effort needed to follow up with the Fleet on system and process improvements. Much of the possible immediate value of FBE results has not been realized.

FBE-K, even the CPX portion, present opportunities for Fleet follow-up. Areas that have been identified as fruitful for doing this are:

Development of TST SOP for an afloat CJTF
Design of the processes for a Fleet Flagship to function as a JFN TST hub.
Developing TST processes and SOP for less well-equipped ships/units.

Undertaking these suggested Fleet follow-up items will require a shift of funds and manpower to this activity.

H.2 CPX RECOMMENDATIONS

H.2.1 FLEET FOLLOW-UP

Fleet Battle Experiments have two purposes: (1) to advance and improve the capabilities of systems and processes, and (2) to move new operational capabilities to Navy operating units. Part of the reason for doing number one with operational units is that, at some point, capabilities testing must be done in a realistic, human-in-the-loop environment. Part of the reason for a Fleet participating in an experiment is to improve capabilities and the ensuing "leave-behinds" that can occur. Leave-behinds are not only equipment but also new or improved processes.

To date, most leave-behinds have been transitory rather than permanent improvements. A telling example was a comment made by VADM Metzger, then C7F, during an FBE presentation: "What happened to the processes we put in place following Delta?" The answer was that they had disappeared due to staff changes. The basic problem was that there was no process or program to make the changes permanent.

It is recommended that NWDC institute a process with Seventh Fleet to take the results from FBE-K and develop TST CONOPS and TTPs, in partnership with the Fleet, that will be adopted by the Fleet. Results from CPX indicate that follow-on development would most profitably be in the following areas:

1. Development of TST CONOPS and TTPs for a BLUE RIDGE CJTF.
2. Develop a concept for BLUE RIDGE as a hub for TST information.
3. Following the hub concept, specify what systems are needed for the range of users included in the network, including "disadvantaged" users.
4. Develop procedures and guidelines for TST operations for all users, including situations when full JFN capabilities are not available, or completely unavailable.

Adopting this recommendation will entail a significant shift in the way NWDC does business. To date, personnel have ceased involvement with an FBE once it is completed, moving on to the next event. Following this recommendation means that personnel would continue to work on the initiatives associated with an experiment for some time after it is physically completed. This requires a shift of resources to the follow-up aspect of an experiment. It is believed that doing so will produce a significant improvement in NWDC productivity as well as produce an overall cost savings to the Navy.

H.2.2 EXPERIMENTATION STRUCTURE

Operational field experiments are expensive, both in terms of real fund expenditures and in terms of the use of platforms and their personnel. Field experimentation as the primary data acquisition means is not cost effective. Also, experience has shown that it is not possible to produce quality results when there is an overlap between analysis for one experiment and planning for the next. With such overlap, lessons learned do not carry over into improvements

for the next event.

Another problem involved the mechanics of having a "learning" experiment overlaid on a Fleet exercise. There is a basic incompatibility. Instead, one should have preliminary learning occur before going into the field then an exercise used for human-in-the-loop and operational testing to ensure validity. Using this approach will allow for tighter coupling between experiment and exercise objectives. The goals of the exercise will always be primary and one can adapt the experiment to those goals and produce high quality results that are directly applicable to the Fleet.

It is recommended that a series of appropriate studies be performed to meet learning objectives, including workshops and even laboratory experiments. Going into the field would occur only when needed for validation. Hence, FBEs would not be events that occur on a regular schedule, and perhaps not exist in their current form. Rather, when a particular study area progressed to the point of needing to do so, an appropriate venue for operational field-testing would be sought. This could be identified as an LOE, a culmination event, or whatever would be appropriate.

H.2.3 EXPERIMENTATION HARDWARE

The experience in past Fleet Battle Experiments has been that there were always some equipment problems. Perhaps this is to be expected, but it should be on a minor scale and the type of problem that can be quickly remedied. FBE-K CPX was perhaps the worst situation encountered over the FBE series, with major equipment problems significantly disrupting the Fires Initiative.

A policy is needed where equipment and interfaces must be fully tested and functionality ensured prior to an experiment. A limited objective experiment (LOE) devoted to equipment testing is recommended. This may be costly, but not be as costly as losing large portions of the desired results during a Fleet Battle Experiment.

H.2.4 EXPERIMENTATION DATA

Three types of data are typically obtained during an operational field experiment: (1) subjective opinions about the performance of systems and processes, (2) subject matter experts logging event observations, and (3) electronic data logged within and between hardware systems. The latter type includes simulation data.

Planning an experiment requires close coupling between the detailed goals of an initiative and data elements to be captured. Analysis of an experiment requires complete sets of all three types of data so that event chains can be reconstructed and the context within which events occurred can be fully understood. A missing data element, or link, in the event chain breaks it and detracts from the ability to fully understand what occurred and why. Absent context means cause-and-effect relationships cannot be established.

To date it has not been possible to obtain all of the needed electronic data. Part of the reason for this is that doing so is expensive and funds have not been made available. The recommendation is made that the lists of electronic data requirements that have been provided be prioritized, decisions made as to which data will be obtained, system owners directed to obtain the data and make it available for analysis, and that adequate funding be provided for the purpose. In addition, impact statements should be developed for those cases where the data will not be available and deficiencies be taken into account in experiment planning.

H.2.5 EXPERIMENT PLANNING STABILITY

CPX was an unusual situation in that there were major changes in the experiment structure (e.g. lack of a JFACC Forward) shortly before the experiment, and then personnel shortfalls due to BLUE RIDGE departing early for the typhoon. However, it is not unusual in FBEs to have equipment and process changes occur right up to the beginning of an experiment. Such changes disrupt data capture and analysis plans and can even make it impossible to capture data required to meet Initiative objectives.

It is recommended that an experiment be "locked down" **four** months prior to its start. An exception would be when there is a series of events that includes an equipment testing LOE prior to the field experiment. In this case, the LOE should occur six weeks prior to the operational experiment and the lock-down occur within one week after the LOE.

H.2.6 SIMULATION AND TRAINING

CPX was different from previous FBEs in that it had a definite training aspect associated with JFN and SOP evaluation. The stated purpose of the evaluations was that they be conducted for a particular C2 configuration and operational situation. Training was to be conducted using TES-N to prosecute TSTs. The operational situation was to be created by simulation. Training and evaluation were significantly negatively affected by the simulation's lack of fidelity.

It is recommended that realistic training modules be developed for TES-N and JFN. This could be done with pre-recorded real imagery and preset scenarios as is done for other systems.

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